2475 Regina Street

Site Servicing and Stormwater Management Report

Stantec

Prepared for:
Windmill Development Group

June 05, 2025

Prepared by:
Stantec Consulting Ltd.

Project/File:
160401689

Stantec Consulting Ltd.

Revision	Description	Author	Date	Quality Check	Date	Independent Review	Date
0	SPC Submission	Michael W.	2024-03-27	Dustin T.	2024-03-27	Peter M.	2024-03-27
1	Updated Site Plan	Michael W.	2024-11-25	Dustin T.	2024-11-28	Peter M.	2024-11-25
2	Revised	Michael W.	2025-02-12	Dustin T.	2025-02-12	Peter M.	2025-02-12
3	Revised	Michael W.	2025-06-05	Dustin T.	2025-06-05	Peter M.	2025-06-05

The conclusions in the Report titled 2475 Regina Street are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

Stantec has assumed all information received from Windmill Development Group (the "Client") and third parties in the preparation of the Report to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

This Report is intended solely for use by the Client in accordance with Stantec's contract with the Client. While the Report may be provided by the Client to applicable authorities having jurisdiction and to other third parties in connection with the project, Stantec disclaims any legal duty based upon warranty, reliance or any other theory to any third party, and will not be liable to such third party for any damages or losses of any kind that may result.

Prepared by

Signature

Michael Wu, E.I.T

Printed Name

Reviewed by

Signature

Dustin Thiffault, P.Eng.

Printed Name

LICENSED PROFESSIONAL ENGINEER
D. C. THIFFAULT
100186107
2025-06-16
PROVINCE OF ONTARIO

Approved by

Signature

Peter Moroz, P.Eng., MBA

Printed Name

Table of Contents

List of Tables

List of Figures

List of Appendices

1 Introduction

Stantec Consulting Ltd. has been commissioned by Windmill Development Group to prepare the following Site Servicing and Stormwater Management (SWM) report in support of a Site Plan Control (SPC) application for the proposed development located at 2475 Regina Street in the City of Ottawa

The 1.04 ha site is situated at the east end of Regina Street and has undergone zoning by-law amendment to R5C and comprises of an existing one-storey long term care home operated by Parkway House with surface parking and green open space. The site is bound by the Byron Linear Tramway Park and a former Ottawa Transportation Commission streetcar right-of-way to the north, Lincoln Heights Road, Regina Street, and an existing residential development to the west, the Kichi Zibi Mikan Parkway and Pinecrest Creek to the east, and Richmond Road to the south, as shown in **Figure 1.1** below.

Figure 1.1: Key Plan of Site

The proposed 1.04 ha site will be developed in two phases, with the first phase consisting of a 7-storey apartment building and a 16-storey apartment building, while the second phase will consist of a 28-storey apartment building. Diamond Schmitt Architects has prepared a site plan dated November 7th, 2024, as shown in **Appendix A.1**, while the buildings and unit type breakdown are listed in **Table 1.1** below.

Table 1.1: Unit Type Breakdown

Unit Type	Building A1	Building T1	Building T2	Total
Studio	13	15	-	**28**
One-bedroom	43	90	170	**303**
Two-bedroom	19	59	122	**200**
Three-bedroom	-	15	19	**34**
LTC Bed	12	-	-	**12**
Total	**87**	**179**	**311**	**577**

1.1 Objective

This site servicing and stormwater management (SWM) report presents a servicing scheme that is free of conflicts, provides on-site servicing in accordance with City of Ottawa Design Guidelines, and uses the existing municipal infrastructure in accordance with any limitations communicated during consultation with the City of Ottawa staff. Details of the existing infrastructure located within the Regina Street and Lincoln Heights Road rights of way (ROW) were obtained from available as-built drawings and site topographic survey.

Criteria and constraints provided by the City of Ottawa have been used as a basis for the detailed servicing design of the proposed development. Specific and potential development constraints to be addressed are as follows:

Potable Water Servicing

- Estimate water demands to characterize the feed for the proposed development which will be serviced from the existing 150 mm diameter watermain on Regina Street and/or 203 mm diameter watermain on Lincoln Heights Road.
- Watermain servicing for the development is to be able to provide average day, maximum day, and peak hour demands (i.e., non-emergency conditions) at pressures within the allowable range of 276 to 552 kPa (40 to 80 psi)
- Under fire flow (emergency) conditions with maximum day demands, the water distribution system is to maintain a minimum pressure greater than 140 kPa (20 psi)

Wastewater Servicing

- Estimate wastewater flows generated by the development and size sanitary sewers which will outlet to the existing 375 mm diameter sanitary sewer located on Regina Street and Lincoln Heights Road.

Stormwater Management and Servicing

- Determine the stormwater management storage requirements to meet the allowable release rate based on SWM Guidelines for the Pinecrest Creek / Westboro Study Area.

- Determine Post development peak 100-year flows and excess stormwater to be detained on-site to meet a 5-year pre-development target release rate.
- Define major and minor conveyance systems in conjunction with the proposed grading plan.
- Define and size the proposed storm services that will be connected to the existing 300 mm diameter municipal storm sewer within the Regina Street ROW.

Prepare a grading plan in accordance with the proposed site plan and existing grades.

Drawing SSP-1 illustrates the proposed internal servicing scheme for the site.

2 References

Documents referenced in preparation of this site servicing and stormwater management report for 2475 Regina Street include:

- *City of Ottawa Design Guidelines – Water Distribution*, City of Ottawa. July 2010 (including all subsequent technical bulletins).
- *City of Ottawa Sewer Design Guidelines (SDG),* City of Ottawa, October 2012 (including all subsequent technical bulletins).
- *Geotechnical Investigation,* Proposed Mixed-Use Development 2475 Regina Street, Ottawa, Ontario, Prepared for Parkway House Development Fund LP by Paterson Group, Revised June 13, 2025.
- *Geotechnical Investigation,* Proposed Servicing Alignment 2475 Regina Street, Ottawa, Ontario, Prepared for Windmill Developments, June 17, 2024*.*
- *Stormwater Management Guidelines for the Pinecrest Creek/Westboro Area Final Report,* Prepared for Planning and Infrastructure, City of Ottawa by J.F. Sabourin and Associates Inc., May 2019.
- *Stormwater Management Design Criteria for the Pinecrest Creek/Westboro Area,* City of Ottawa, May 2020.
- *Water Supply for Public Fire Protection,* Fire Underwriters Survey, 2020.
- *2475 Regina Street – Adequacy of Services Report,* Stantec Consulting Ltd., Revision 2, January 26, 2023

3 Potable Water Servicing

3.1 Background

The proposed development is located within Pressure Zone 1W of the City of Ottawa's Water Distribution System. The existing Parkway House maintains a water service lateral connection to the existing 150 mm diameter watermain on Regina Street with an existing fire hydrant on site. The existing services will be blanked at the main by City forces while the existing hydrant will be disposed of off site, as shown in the Existing Conditions and Removals Plan (see **Drawing EX-1**).

3.2 Water Demands

3.2.1 Domestic Water Demands

The City of Ottawa Water Distribution Guidelines (July 2010) and ISTB 2021-03 Technical Bulletin were used to determine water demands based on projected population densities for residential areas and associated peaking factors. The population was estimated using an occupancy of 1.0 persons per unit for the long-term care units, 1.4 persons per unit for studio and one-bedroom apartments, 2.1 persons per unit for two-bedroom apartments, and 3.1 persons per unit for three-bedroom apartments. Based on the unit type breakdown in **Table 1.1**, the proposed building is estimated to have a total population of 996 persons.

A daily rate of 280 L/cap/day has been used to estimate average daily (AVDY) potable water demand for the residential units, and 400 L/cap/day for the long-term care units. Maximum day (MXDY) demands were determined by multiplying the AVDY demands by a factor of 2.5 for residential areas and 1.5 for commercial areas and long-term care units. Peak hourly (PKHR) demands were determined by multiplying the MXDY by a factor of 2.2 for residential areas and 1.8 for commercial areas and long-term care units. The estimated demands for each tower are summarized in **Table 3.1** below and detailed in **Appendix B.1**.

Table 3.1: Estimated Water Demands

Phase	Building	No. of Units	Population	AVDY (L/s)	MXDY (L/s)	PKHR (L/s)
1	Parkway House (A1)	87	130	0.44	1.04	2.26
	West Tower (T1)	179	318	1.03	2.57	5.66
	Total	**266**	**448**	**1.47**	**3.61**	**7.92**
2	East Tower (T2)	311	553	1.79	4.48	9.86
Total Site		**577**	**1001**	**3.3**	**8.1**	**17.8**

3.2.2 Fire Flow Demands

Fire flow requirements were estimated using Fire Underwriters Survey (FUS) methodology. The FUS estimate is based on a building of non-combustible construction type with two-hour fire rated structural members, equipped with full protections of all vertical openings. As a result, the 'gross construction area' of the largest floor (floors with the largest footprint, 1378 m^2) + 25 % of the gross construction area of two additional floors immediately above them was used for the purpose of the FUS calculation, as per page 22 of the *Fire Underwriters Survey's Water Supply for Public Fire Protection*, 2020.

Additionally, it is anticipated that the building will be equipped with an automatic sprinkler system that is fully supervised and conforms to the NFPA 13 standard. The 7-storey Parkway House was determined to have the largest fire flow demand at approximately 4,000 L/min (66.7 L/s). Detailed fire flow calculations per the FUS methodology are provided in **Appendix B.2,** while confirmation of construction type is provided in **Appendix A.3**. Per the FUS, a fully supervised sprinkler system includes:

- A distinctive supervisory signal to indicate conditions that could impair the satisfactory operation of the sprinkler system (a fault alarm), which is to sound and be displayed, either at a location within the building that is constantly attended by qualified personnel (such as a security room), or at an approved remotely located receiving facility (such as a monitoring facility of the sprinkler system manufacturer); and
- A water flow alarm to indicate that the sprinkler system has been activated, which is to be transmitted to an approved, proprietary alarm-receiving facility, a remote station, a central station, or the fire department.

3.3 Level of Servicing

3.3.1 Boundary Conditions

The estimated domestic water and fire flow demands were used to define the level of servicing required for the proposed development from the municipal watermain and hydrants within the Regina Street ROW. The boundary conditions provided by the City of Ottawa on March 22, 2024 (see **Appendix B.3**). Note that the boundary conditions were requested with a fire flow demand of 167 L/s (10,000 L/min) for a conservative estimate of the hydraulic grade line (HGL) under worst-case fire flow scenario.

Table 3.2: Boundary Conditions

	Regina Street	Lincoln Heights Road
Min. HGL (m)	108.3	
Max. HGL (m)	115.8	
Max. Day + Fire Flow (167 L/s) (m)	86.6	93.8

3.3.2 Allowable Domestic Pressures

The desired normal operating pressure range in occupied areas as per the City of Ottawa 2010 Water Distribution Design Guidelines is 345 kPa to 552 kPa (50 psi to 80 psi) under a condition of maximum daily flow and no less than 276 kPa (40 psi) under a condition of maximum hourly demand. Furthermore, the maximum pressure at any point in the water distribution should not exceed 689 kPa (100 psi) as per the Ontario Building/Plumbing Code; pressure reducing measures are required to service areas where pressures greater than 552 kPa (80 psi) are anticipated in occupied areas.

The proposed finished floor elevation of the first floor, 65.5 m, will serve as the ground floor elevation for the calculation of the residual pressures at ground level. As per the boundary conditions, the on-site pressures are expected to range from 420 to 493 kPa (60.8 to 71.5 psi) under normal operating conditions, which are within the normal operating pressure range defined by the City of Ottawa design guidelines as within 276 kPa to 552 kPa (40 psi to 80 psi). It is anticipated that booster pumps will be required to service the upper floors of the buildings.

3.3.3 Allowable Fire Flow Pressures

The boundary conditions provided by the City of Ottawa indicate that the watermain within Regina Street is expected to maintain a residual pressure of 21.1 m equivalent to 207 kPa (30 psi) under the worst-case fire flow conditions. This demonstrates that the watermains and nearby hydrants can provide the required fire flows while maintaining a residual pressure of 20 psi.

3.3.4 Fire Hydrant Coverage

Each of the buildings will be sprinklered and provided with a Siamese (fire department) connection to the right of the main entrance. There are two existing hydrants in the proximity of the proposed development site, as shown in **Figure 3.1**. While the distance of both hydrants from the proposed development are less than 76 m, HYD-02 is not within 45 metres from the closest Siamese connection per the OBC requirements, while HYD-01 is located within the proposed private roadway and would therefore be removed and disposed for the development.

According to the NFPA 1 Table 18.5.4.3 in Appendix I of the City of Ottawa Technical Bulletin ISTB-2018-02, a hydrant situated less than 76 m away from a building can supply a maximum capacity of 5,678 L/min, while a hydrant situated between 76 m and 152 m away from a building can supply a maximum capacity of 3,785 L/min.

To meet requirements of Section 3.2.5.16(1) of the Ontario Building Code (OBC), two new fire hydrants are proposed within the site, with the west hydrant located at the parking area for the Parkway House and the east hydrant located along the south side of Regina Street between Towers T1 and T2. Both proposed hydrants are within 45 metres from the Siamese connections, as shown on **Drawing SSP-2**.

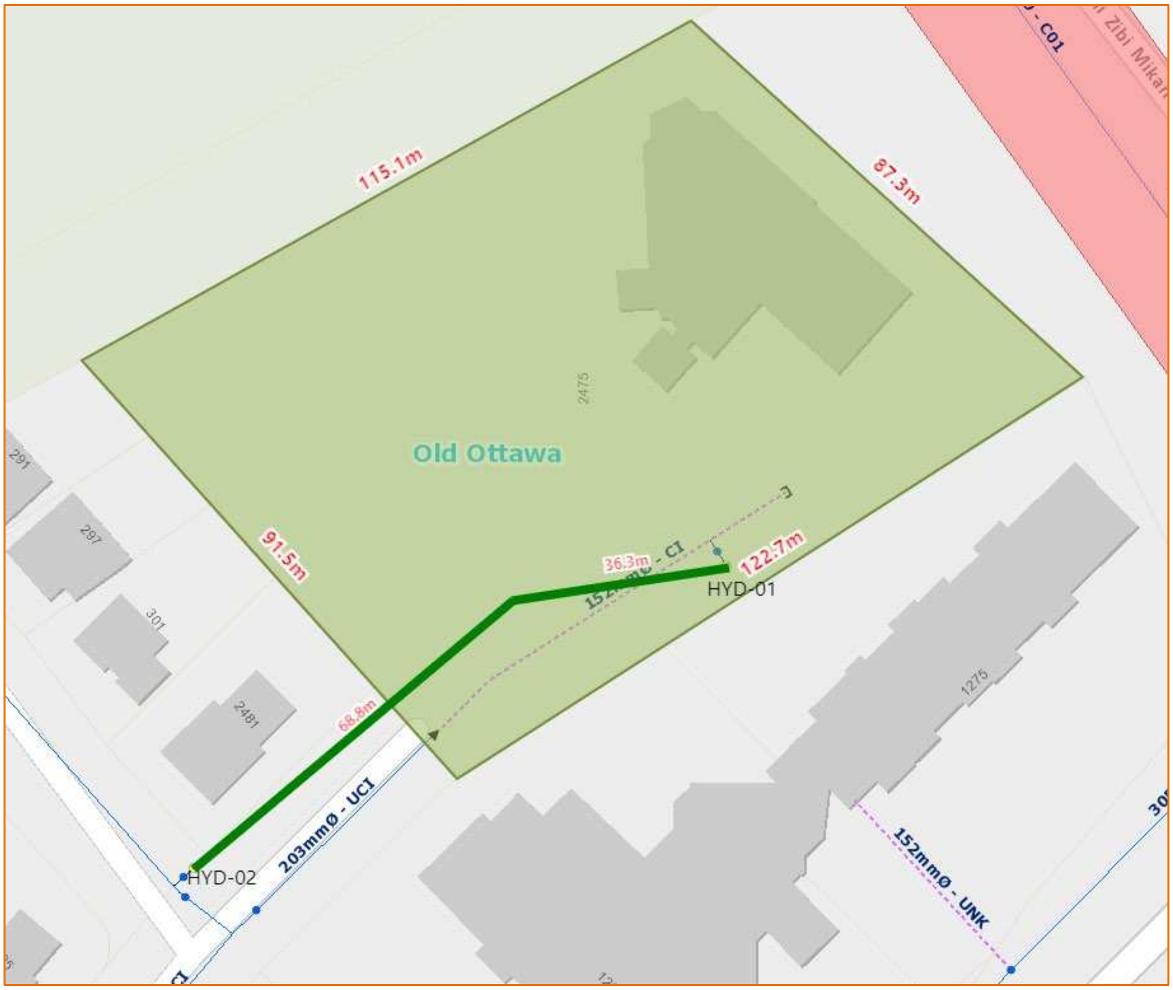


Figure 3.1: Existing Fire Hydrant Coverage Map

3.4 Proposed Water Servicing

The existing 150 mm diameter watermain on site from Regina Street will be upsized to 200 mm and realigned, while a new 200 mm diameter connection to the existing 200 mm diameter watermain on Lincoln Heights Road at the Byron Linear Tramway Park pathway crossing is proposed at the north for redundancy and looping. Windmill Development is in the process of securing the easement through the park for the proposed watermain with the City. A 200mm main isolation valve separating the two connections is proposed in the Lincoln Heights Road watermain. The sizing of the service connections to each building is to be confirmed by the mechanical consultant.

The proposed water servicing is shown in the attached drawing set, with **Drawing SSP-1** showcasing the Phase 1 interim servicing scheme, in which a temporary 200 mm diameter water service is installed to allow for servicing to the existing Parkway House building during construction, and **Drawing SSP-2** showcasing the servicing scheme for the ultimate buildout, where the 200mm diameter service lateral is truncated at the underground parking garage following construction of Tower T2.

Based on the City of Ottawa Water Design Guidelines and the provided boundary conditions, the existing 200 mm diameter watermain on Regina Street and Lincoln Heights Road can provide adequate fire and domestic flows for the subject site.

Booster pumps are required for the building. The mechanical consultant or plumbing contractor will ultimately be responsible to size the service laterals and confirm building pressures are adequate to meet building code requirements. The location of the water services within the property area will be coordinated with the building's architect to accommodate the underground parking structure on Level P1 and P2.

4 Wastewater Servicing

The development will be serviced from the existing 375 mm diameter concrete sanitary sewer within Regina Street and Lincoln Heights Road. The existing 200 mm diameter sanitary sewer within Regina Street east of the existing manhole at the intersection with Lincoln Heights Road is proposed to be removed and replaced at an increased size and reduced slope to facilitate gravity connection for the proposed development as shown in **Drawing EX-1**.

4.1 Design Criteria

As outlined in the City of Ottawa Sewer Design Guidelines and the MECP Design Guidelines for Sewage Works, the following criteria were used to calculate the estimated wastewater flow rates and to determine the size and location of the sanitary service lateral:

- Minimum velocity = 0.6 m/s (0.8 m/s for upstream sections)
- Maximum velocity = 3.0 m/s
- Manning roughness coefficient for all smooth wall pipes = 0.013
- Minimum size of sanitary sewer service = 135 mm
- Minimum grade of sanitary sewer service = 1.0 % (2.0 % preferred)
- Average wastewater generation = 280 L/person/day (per City Design Guidelines)
- Peak Factor = based on Harmon Equation; maximum of 4.0 (residential)
- Harmon correction factor = 0.8
- Infiltration allowance = 0.33 L/s/ha (per City Design Guidelines)
- Minimum cover for sewer service connections – 2.0 m
- Population density for long-term care unit – 1.0 persons/unit
- Population density for one-bedroom and studio apartments – 1.4 persons/apartment
- Population density for two-bedroom apartments – 2.1 persons/apartment
- Population density for three-bedroom apartments – 3.1 persons/apartment

4.2 Wastewater Generation and Servicing Design

The estimated peak wastewater flows generated are based on the current site plan and unit breakdown as shown in **Table 1.1**. The anticipated wastewater peak flow generated from the proposed development is summarized in **Table 4.1** below and detailed in **Appendix C.1**.

Table 4.1: Estimated Wastewater Peak Flow

Residential Units				Institutional Areas			Infiltration Flow (L/s)	Total Peak Flow (L/s)
Number of Units	Population	Peak Factor	Peak Flow (L/s)	Area (ha)	Peak Factor	Peak Flow (L/s)		
577	1001	3.24	10.5	0.14	1.5	0.1	0.3	10.8

- Average residential sanitary flow = 280 L/p/day and design institutional flow based on 28,000 L/ha/day per City of Ottawa Sewer Design Guidelines
- Peak factor for residential units calculated using Harmon's formula, using a Harmon correction factor of 0.8.
- Apartment population estimated based on 1.4 persons/unit for studio and one-bedroom apartments, 2.1 persons/unit for two-bedroom apartments, and 3.1 persons/unit for three-bedroom apartments.
- Infiltration flow = 0.33 L/s/ha

An updated memo addressing the capacity requirements for the Lincoln Heights Pumps station reflecting the observed wet weather flows of 44l/s within the station was prepared and submitted to the City on June 6, 2024. Per our recommendations, the new pumps being installed under the current facility upgrade (City Contract No. CP000546) are able to meet and exceed the required flow of 55l/s to accommodate the wet weather flow (44l/s) plus that from the proposed development noted above. No additional physical upgrades are anticipated to accommodate the Regina Street development based on the information available under the current construction project at Lincoln Heights Pumping Station.

4.3 Proposed Sanitary Servicing

The site is proposed to be serviced by an onsite sanitary sewer network comprising of 200mm to 300mm diameter sanitary sewers to effectively convey wastewater flows from the proposed buildings to the existing manhole on Regina Street (MHSA25242) as shown in **Drawings SA-1 and SSP-2**. Final sizing of the laterals is to be confirmed by the mechanical consultant. Full port backwater valves are to be installed on all sewer services within the site to prevent any surcharge from the downstream sewer from impacting the proposed development and will be coordinated with the building mechanical consultant.

The phasing of the sanitary servicing is shown in the attached drawing set, with **Drawing SSP-1** showcasing the Phase 1 servicing scheme, in which a temporary 125 mm diameter service lateral (to match existing site conditions) is installed to allow for servicing to the existing Parkway House building during construction, and **Drawing SSP-2** showcasing the servicing scheme for the ultimate buildout, where the service lateral is truncated at the underground parking garage following construction of Tower T2.

The proposed sanitary laterals for the buildings will be installed to provide a gravity outlet for the basement level and all floors above grade. See **Drawing SSP-2** for further details of the sewer connections. Furthermore, floor drains will be installed in the parking garage to collect wastewater and convey it to the building's sanitary service laterals. A monitoring manhole (SAN 1) has been provided at the most downstream connection to sewers within Regina Street. The location and layout of the sanitary network within the proposed parking structure internal to the proposed building will be coordinated with the mechanical and structural engineer.

5 Stormwater Management and Servicing

5.1 Objectives

The goal of this stormwater servicing and stormwater management (SWM) plan is to determine the measures necessary to control the quantity and quality of stormwater released from the proposed development to meet the criteria established during the consultation process with City of Ottawa and to provide sufficient details required for site plan control approval.

5.2 SWM Criteria and Constraints

Criteria were established by combining current design practices outlined by the City of Ottawa Design Guidelines (OSDG, October 2012, as amended), through consultation with City of Ottawa staff, and referencing the Stormwater Management Design Criteria for the Pinecrest Creek/Westboro Area (PWDC). The following summarizes the criteria, with the source of each criterion indicated in brackets:

General

- Use of the dual drainage principle (OSDG)
- Wherever feasible and practical, site-level measures should be used to reduce and control the volume and rate of runoff (OSDG)
- Assess impact of 100-year event outlined in the City of Ottawa Sewer Design Guidelines on the major and minor drainage systems (OSDG)

Storm Sewer & Inlet Controls

- Discharge for each storm event to be restricted to a 2-year storm event pre-development rate with a maximum pre-development C coefficient of 0.5 (OSDG, and City of Ottawa pre-consultation)
- Peak flows generated from events greater than the 2-year and including the 100-year storm must be detained on site (OSDG, and City of Ottawa pre-consultation)
- The preferred stormwater system outlet for this site is the 300 mm diameter storm sewer within the Regina Street ROW. (City of Ottawa pre-consultation)
- The foundation drainage system is to be independently connected to sewer main unless being pumped with appropriate back up power, sufficient sized pump, and backflow prevention. (City of Ottawa pre-consultation)
- T_c should be not less than 10 minutes. (OSDG).
- Capture, retain, and infiltrate site runoff resultant from storm events up to and including (at minimum) the 10 mm event. (PWDC)

Surface Storage & Overland Flow

- Building openings to be a minimum of 0.30 m above the 100-year water level (OSDG)
- Maximum depth of flow under either static or dynamic conditions shall be less than 0.35 m (OSDG)

- Provide adequate emergency overflow conveyance off-site with a minimum vertical clearance of 15 cm between the spill elevation and the ground elevation at the building envelope in the proximity of the flow route or ponding area (OSDG)

Quality Control

- Site must provide quality control measures that meet 80 % TSS Removal (PWDC)

5.3 Existing Conditions

The existing site (1.04 ha) consists of an existing one-storey long term care home on the eastern area of the site, an access road and parking lot, and green landscaped areas. The existing building will be removed to allow for the proposed development, as shown in the Existing Conditions and Removals Plan (see **Drawing EX-1**).

Three sub-catchments were delineated in the Existing Conditions Storm Drainage Plan (see **Drawing EXSD-1**) based on the surface types (pervious vs. impervious), as well as the direction of uncontrolled discharge under existing conditions. The EXSD-1 plan was used to establish the overall site pre-development runoff coefficient of C=0.41, as summarized in **Table 5.1** below.

Table 5.1: Summary of Existing Subcatchment Areas

Catchment Areas	C	A (ha)
EX-1	0.22	0.50
EX-2	0.61	0.47
EX-3	0.44	0.07
Total	**0.41**	**1.04**

The pre-development release rates for the site have been determined using the rational method and the drainage characteristics identified above. A time of concentration for the pre-development area was first determined using the FAA method. As calculated time of concentrations were determined to be below 10 minutes, the minimum 10-minute Tc was assigned. The peak pre-development flow rates shown have been calculated using the rational method as follows:

$$Q = 2.78\,(C)(I)(A)$$

Where:

Q – Peak flow rate, L/s

C – Site Runoff Coefficient

I – Rainfall intensity, mm/hr (per City of Ottawa IDF curves)

A – Drainage Area, ha

$$\text{Intensity (mm/hr)} = \frac{732.951}{(10 + 6.199)^{0.810}} = 76.81\ \text{mm/hr}$$

$$Q = 2.78(0.41)(76.81\text{mm/hr})(1.04\ \text{ha}) = \mathbf{91.1\ L/s}$$

Areas EX-1 and EX-3 have been identified as discharging overland to the adjacent park lands and NCC pathway respectively under existing conditions. Peak runoff from areas EX-1 and EX-3 have been determined to be 54.6L/s and 15.3L/s under the 100-year storm event.

5.4 Stormwater Management Design

A hydrologic/hydraulic model was completed with PCSWMM for the sewers and roadways/parking areas within the proposed development, accounting for the estimated major and minor systems to evaluate the storm sewer infrastructure and ensure release rates meet the previously defined target criteria. The use of PCSWMM for modeling of the site hydrology and hydraulics allowed for an analysis of the system response during various storm events. The following assumptions were applied to the model:

- Hydrologic parameters as per Ottawa Sewer Design Guidelines, including Horton infiltration, Manning's 'n', and depression storage values.
- 3-hour Chicago and 12-hour SCS distributions for 2-year, 5-year, and 100-year storm events were used to evaluate the urban component of the dual drainage (i.e. minor system capture rates, total overland flow depth, hydraulic grade line (HGL), etc.).
- A 10mm, 4-hour Chicago storm was used to evaluate the performance of the proposed stormwater management system for retention per requirements of the PWDC.
- The 'climate change' scenario created by adding 20% of the individual intensity values of the 100-year 3-hour Chicago storm at each specified time step was used as an analytical tool to establish the function of the system under extreme events.

Minor system capture rates within the proposed development were restricted to the 2-year peak runoff rate where surface catch basins with ICDs are identified, and uncontrolled elsewhere.

5.4.1 SWMM Dual Drainage Methodology

The proposed development is modeled in one PCSWMM model as a dual conduit system, where:

1) The minor system consists of storm sewers, represented by circular conduits, and manholes, represented by storage nodes;

2) The major system consists of overland spills, represented by weirs and irregular conduits using street-shaped cross-sections to represent the assumed overland road network with streets at varying slopes, and catch basins with surface ponding areas, represented by storage nodes.

The two systems are connected by outlet/orifice link objects, which represent inlet control devices (ICDs), that connect storage nodes representing catch basins to storage nodes representing manholes. Subcatchments are linked to the nodes representing catch basins and ponding areas so that generated hydrographs are directed there firstly.

5.4.2 Model Input Parameters

Drawing SD-1 summarizes the discretized subcatchments used in the analysis of the proposed development. All parameters were assigned as per applicable Ottawa Sewer Design Guidelines (OSDG); Ontario Ministry of the Environment, Conservation, and Parks (MECP); and background report requirements.

5.4.2.1 Hydrologic Parameters

Key parameters for the proposed development areas are summarized below, while example input files are provided for the 100-year, 3-hour Chicago storm in **Appendix D** which indicate all other parameters. For all other input files and results of storm scenarios, please examine the electronic model files located on the digital media provided with this report. This analysis was performed using PCSWMM, which is a front-end GUI to the EPA-SWMM engine. Model files can be examined in any program which can read EPA-SWMM files version 5.2.4.

Table 5.2: presents the general subcatchment parameters used for the proposed development.

Table 5.2: General Subcatchment Parameters

Parameter	Value
Infiltration Method	Horton
Max. Infil. Rate (mm/hr)	76.2
Min. Infil. Rate (mm/hr)	13.2
Decay Constant (1/hr)	4.14
N Imperv	0.013
N Perv	0.25
Dstore Imperv (mm)	1.57
Dstore Perv (mm)	4.67
Zero Imperv (%)	0

Table 5.3 presents the individual parameters that vary for each of the proposed subcatchments in the model. Subcatchment width parameters were determined by multiplying each subcatchment's area in hectares by 225 where an appropriate width per the OSDG could not be readily identified (lumped or highly irregular catchments). Subcatchment imperviousness was measured directly from the site plan within AutoCAD considering all paved access, sidewalks, and roof areas as entirely impervious areas, and remaining grassed areas as entirely pervious. Weighted runoff 'C' coefficients were determined for each subcatchment considering impervious areas as C=0.90, and pervious as C=0.20.

Table 5.3: Individual Subcatchment Parameters

Subcatchment ID	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	% Impervious
CB-1	0.098	121.0	8.1	3.0	100.00
CBMH-2	0.047	33.0	14.2	3.0	85.71
DRN2A	0.049	41.0	11.9	3.0	100.00
DRN2B	0.080	27.0	29.7	3.0	71.43
GRN-1	0.028	6.3	44.4	3.0	14.29
GRN-2	0.065	14.6	44.4	3.0	14.29
GRN-3	0.021	4.8	44.4	3.0	14.29
L102A	0.123	51.0	24.2	3.0	80.00
L103A	0.052	40.0	13.1	3.0	100.00
LID-1	0.116	26.1	44.4	3.0	8.57
LID-2	0.060	39.0	15.4	3.0	42.86
LID-3	0.083	103.0	8.1	3.0	14.29
RAMP	0.009	15.0	6.3	15.0	100.00
ROOF-1A	0.031	7.0	44.4	3.0	100.00
ROOF-1B	0.023	5.2	44.4	3.0	100.00
ROOF-2A	0.040	9.0	44.4	3.0	100.00
ROOF-2B	0.012	2.7	44.4	3.0	100.00
ROOF-3A	0.067	15.1	44.4	3.0	100.00
ROOF-3B	0.031	7.0	44.4	3.0	100.00

5.4.2.2 Surface and Subsurface Storage Parameters

Table 5.4 summarizes the storage node parameters used in the model. Storage nodes represent the depth of the proposed catch basin barrel plus an additional depth to represent the maximum allowable surface water ponding depth. Surface storage was estimated based on surface models created in AutoCAD for the proposed grading plan. See **Drawing SD-1** for surface storage depths, areas, and volumes.

Table 5.4: Surface Storage Parameters

Storage Node	Invert Elevation (m)	Rim Elevation (m)	Ponding Depth at Spill (m)	Ponding Area (m2)	Ponding Volume (m3)
CB1	63.72	65.50	0.20	220.1	14.7
CBMH2-S	61.15	64.99	-	-	-
L102A-S	63.95	65.36	0.31	458.3	47.4
L103A-S	64.03	65.33	0.20	175.0	11.7
ROOF1-S	100.00	100.15	0.15	184	9.2
ROOF2B-S	100.00	100.15	0.15	97	4.8
ROOF3-S	100.00	100.15	0.15	248	12.4
LID1A	63.09	63.54	0.35	43	10.0
LID1B	62.58	63.04	0.36	41	9.9
LID1C	62.00	62.35	0.35	96.1	18.2
LID2	64.85	65.35	0.35	40	15.0
LID3	63.1	63.9	0.70	92.8	31.2

Underground storage was required to further control runoff during the 100-year storm event. Two irrigation cisterns (node IRR-TANK and IRR-TANK2 totalling 90m3) have been modeled internally to the building underground parking levels that will receive runoff from building rooftops (both controlled areas as described in sections below and uncontrolled green roofs). The cistern volume will be used for on-site irrigation during periods of low rainfall. The cistern is to maintain an overflow pipe discharging to the main building storm service connection.

The building storm service receives captured runoff from uncontrolled surface area drains, the irrigation tank overflow, as well as a surface inlets in areas LID-1 through LID-3 to manage water elevations within surface storage in the southeast, northwest, and northeast corners of the site. Despite provision of adequate surface storage to retain the 100-year storm event, surface inlets have been provided for grassed areas within areas LID-1 through LID-3 based on assertion from City of Ottawa staff that LID measures reliant on infiltration will not contribute to the overall quantity storage for the development.

Underdrains for areas LID-1 and LID-3 contribute directly to CBMH 2 via subdrains constructed per City Std. S29. The subdrain and clear stone trench volume for areas lying below the emergency overland spill elevation of 62.35 have been incorporated as volumetric storage within the PCSWMM model with an assumed trench porosity of 0.4 (approximately 26.5m3 of available storage). Due to the invert elevation of CBMH 2, discharge will be directed internally to proposed buildings (Tower 2 in the ultimate condition, and Tower 1 under interim buildout), with discharge pumped to the building storm service (adjacent to STM 103) at a rate of 4 L/s.

It is assumed that due to the elevation of the receiving storm sewer that the building storm sewer will be discharged via pump internal to the proposed buildings. This discharge along with runoff captured by catch basins in the parking lot external to the building is in turn routed to a subsurface storage unit composed of StormTech SC-310 chambers. The StormTech unit has been sized to provide at minimum 116m3 of storage above the invert of the facility (top of the clear stone bedding layer). Outflow from the unit is restricted by a single ICD as well as an overflow weir to permit the system to discharge should the orifice become blocked.

A standing water elevation corresponding to the invert of the facility has been applied to the PCSWMM model for the 2, 5, and 100 year storm events for conservatism, assuming that the water stored below the invert of the unit has not had time to exfiltrate prior to a significant storm event. The clear stone bedding layer is used for quality control and outflow volume reduction to meet other SWM targets as described in sections below.

Table 5-6 presents the parameters for orifice and outlet link objects in the model, which represent ICDs and restricted roof release drains respectively. The 300mm circular orifice was assigned a discharge coefficient of 0.61, whereas ICDs representing IPEX Tempest HF controls were assigned a discharge coefficient of 0.572 to match manufacturer discharge curves. The 300mm circular orifice and overflow weir are placed within a manhole structure at the outlet of the proposed StormTech facility. An outlet with capture curve defined by the inlet capacity of a catch basin grate per City standard drawing S30 has been applied to the underdrains for areas LID-1 through LID-3. Green Roofs are not flow controlled, and instead discharge directly to the building cistern.

Spillway weirs have been modeled to connect surface storage within LID-1, LID-2, and LID-3 to allow for an emergency overland flow route away from proposed buildings should blockage or a storm event exceeding required design criteria occur as demonstrated on **Drawing GP-1 and GP-2**.

The roof release discharge curves assume the use of standard Watts Model R1100 Accutrol controlled release roof drains as noted in the calculation sheets included in **Appendix D**. Details for the IPEX ICDs and Watts drains are included as part of **Appendix D**. Watts Drainage "Accutrol" roof drain weir data has been used to calculate a practical roof release rate and detention storage volume for the rooftops. It should be noted that the "Accutrol" weir has been used as an example only, and that other products may be specified for use, provided that the total roof drain release rate is restricted to match the maximum rate of release indicated in **Table 5.5**, and that sufficient roof storage is provided to meet (or exceed) the resulting volume of detained stormwater.

Table 5.5: Roof Control Areas

Roof ID	Accutrol Weir Setting	# of Drains	100-yr Release Rate (L/s)	100-yr Storage Required (cu.m)
ROOF-1B	Closed	3	1.9	7.2
ROOF-2B	Closed	3	1.9	2.5
ROOF-3B	25% Open	3	2.7	9.4

Table 5.6: Outlet/Orifice Parameters

Name	Inlet	Outlet	Inlet Elev.	Type	Diameter (m)
OR1	CB1	103	63.72	IPEX Tempest HF	0.095*
L102A-O	L102A-S	102	63.95	IPEX Tempest HF	0.108
L103A-O	L103A-S	102	64.03	IPEX Tempest HF	0.083
TANK—100	TANK	100	63.50	CIRCULAR ORIFICE	0.300
LID3A-O	LID2	103	65.05	S30 GRATE	-
LID3-O	LID3	CBMH2-S	63.45	S30 GRATE	-
OR2	LID1C	CBMH2-S	62.15	S30 GRATE	-
ROOF1-O	ROOF1-S	IRR-TANK	100.00	ROOF CONTROL	-
ROOF2B-O	ROOF2A-S	IRR-TANK2	100.00	ROOF CONTROL	-
ROOF3-O	ROOF3-S	IRR-TANK	100.00	ROOF CONTROL	-

*Note:CB1 discharge is pumped through building internal plumbing to site storm sewer.

5.4.2.3 Hydraulic Parameters

As per the October 2012 City of Ottawa Sewer Design Guidelines, Manning's roughness values of 0.013 were used for sewer modeling and overland flow corridors representing roadways. Flow over grassed areas were modeled using a Manning's roughness value of 0.25. The storm sewers within the proposed development were modeled to estimate flow capacities and hydraulic grade lines (HGLs) in the proposed condition. The proposed storm sewer design sheet is included in **Appendix D**.

Exit losses at manholes were set for all pipe segments based on the flow angle through the structure. Exit losses were assigned as per City guidelines (Appendix 6b of the guidelines), see **Table 5.7** below.

Table 5.7: Exit Loss Coefficients for Bends at Manholes

Degrees	Coefficient
11	0.060
22	0.140
30	0.210
45	0.390
60	0.640
90	1.320
180	0.020

The proposed development's storm sewers were sized to convey runoff from a 2-Year storm using rational method calculations. The rational method design sheet can be found in **Appendix D**.

5.5 Model Results and Discussion

The following section summarizes the key hydrologic and hydraulic model results. For detailed model results or inputs please refer to the example input files in **Appendix D** and the PCSWMM model in the enclosed digital files.

5.5.1 Hydrologic Results

The following tables demonstrate the peak outflow from each modeled outfall during the design storm events. A free-flowing outfall condition has been modeled for these events to be conservative with respect to peak site release rates. Outfall EX-STRM denotes peak flow conveyance to the downstream existing sewer system within Regina Street, whereas OF-LID1 and OF-LID2 denote spillage from surface storages to the existing City-owned park and NCC pathway system respectively. No spillage to the park or pathway is anticipated for design events up to and including the 100-year storm event. Spillage to the park/pathway does not exceed the pre-development release rates from the site as defined in sections above for areas EX-1 and EX-3 for events up to and including the 100-year storm.

Table 5.8: Outlet/Orifice Parameters

Event	Location	Peak Discharge Rate (L/s)	Target (L/s)
2-Year Chicago	EX-STRM	30.7	-
	OF-LID1	0	-
	OF-LID2	0	-
	TOTAL	**30.7**	**91.1**
5-Year Chicago	EX-STRM	51.5	-
	OF-LID1	0	-
	OF-LID2	0	-
	TOTAL	**51.5**	**91.1**
100-Year Chicago	EX-STRM	85.5	-
	OF-LID1	0	-
	OF-LID2	0	-
	TOTAL	**85.5**	**91.1**
100-Year 12 Hour SCS	EX-STRM	83.1	-

	OF-LID1	0	-
	OF-LID2	0	-
	TOTAL	**83.1**	**91.1**
100-Year Chicago + 20%	EX-STRM	114.2	-
	OF-LID1	17.2	-
	OF-LID2	0.0	-
	TOTAL	**131.4**	**-**
100-Year 12 Hour SCS +20%	EX-STRM	150.4	-
	OF-LID1	26.0	-
	OF-LID2	0.0	-
	TOTAL	**176.4**	**-**

5.5.1.1 Hydraulic Results

The City of Ottawa requires that during major storm events, the maximum hydraulic grade line be kept at least 0.30 m below the underside-of-footing (USF) of any adjacent units connected to the storm sewer during design storm events. As the proposed building perimeter foundation drain will be pumped to the storm sewer, HGLs within the subsurface storage unit will not impact building footings. The maximum hydraulic grade line (HGL) of the underground storage unit reaches 63.98m and 64.19m during the 100 year and 100year +20% Chicago storm event. The HGL elevations in both scenarios remain below the proposed surface elevations as the lowest elevation of the connected catch basins within the aboveground parking structure are at 64.95m.

Table 5.9 presents the maximum total surface water depths (static ponding depth + dynamic flow) above the top-of-grate of ICD controlled catch basins within paved roadways for the 100-year design and climate change storm.

Table 5.9: Maximum Surface Water Depths

Storage Node ID	Structure ID	T/G Elevation (m)	100 Year		100 Year + 20%	
			Max HGL (m)	Surface Water Depth (m)	Max HGL (m)	Surface Water Depth (m)
CB1	CB1	65.15	65.26	0.11	65.29	0.14
L102A-S	L102A	64.95	65.11	0.16	65.15	0.20
L103A-S	L103A	65.03	65.16	0.13	65.18	0.15

5.5.2 Quality Control

As per Criteria 2 of Table 1 of the Stormwater Management Design Criteria for the Pinecrest Creek/Westboro Area, stormwater quality control measures for the site, in which stormwater flows discharge directly into the Ottawa River, are required to meet long term removal of 80 % TSS.

Surface storage areas have been provided via grassed areas at the perimeter of the site within areas LID-1 through LID-3. These features are expected to fill without a minor system outlet during lesser rainfall events (2-year storm and below), with captured runoff slowly infiltrated to the surrounding soil during the inter-event period.

The remainder of captured runoff is directed to the subsurface storage (StormTech) unit to be provided with an extended clear stone layer (porosity = 0.4) beneath the storage system. This layer is proposed to be 1.0m in depth, cover a surface area of approximately 375m2, and is anticipated to provide approximately 150m3 of storage below the outgoing pipe invert to both provide quality control and meet runoff volume control targets noted in sections below. Measured groundwater levels in proximity to the subsurface storage were noted as between elevations 58.35 and 57.47 per the Geotechnical Investigation by Paterson Group, with long term groundwater levels estimated at 4-5m below ground surface. As such, there are no anticipated concerns with impacts to assimilative capacity of the surrounding soil due to groundwater.

Required volumes of storage may be determined through Table 3.2 of the MECP's Stormwater Management Planning and Design Manual for infiltration facilities as noted in the table below:

Table 5.10: Quality Control Storage Volumes

Area ID	SWMP Type	Tributary Area (ha)	Imperviousness	Required Volume (cu.m)	Provided Volume (cu.m)
LID-1	Infiltration	0.116	8.6%	1.9	38.1
LID-3	Infiltration	0.081	14.3%	1.5	31.2
LID-2	Infiltration	0.063	42.9%	1.7	15.0
ROOF1-3, GRN1-3, RAMP, DRN, CSTRN	Infiltration – Subsurface Storage	0.776	80.4%	29.7	132.8

Equation 4.3 within the MECP's Stormwater Management Planning and Design Manual has been used to conservatively assess expected facility drawdown times based on a highly conservative soils percolation rate of 10mm/hr in the event of blockage of the area underdrains. Per the **Table** below, expected facility drawdown times lie in the range of 13-34 hours.

Table 5.11: SWM Facility Drawdown Estimate

Area ID	Volume (cu.m)	Bottom Area (m2)	Percolation Rate (mm/hr)	Drawdown Time (hrs)
LID-1	1.9	36 (14+14+8)	10	13.2
LID-3	1.5	11	10	34.1
LID-2	1.7	19	10	22.4
ROOF1-3, GRN1-3, RAMP, DRN, CSTRN	29.7	375	10	19.8

5.6 Runoff Volume Control

The Stormwater Management Design Criteria for the Pinecrest Creek/Westboro Area outlines a requirement for capture, retention, and infiltration of all site runoff for all storm events up to and including the 10 mm storm event. Runoff volume reduction is anticipated to be provided by intensive green roof areas for some rooftop catchments (areas GRN1-3), via perimeter surface storage provided with minor system underdrain outlet for limited drainage areas (LID1-3), and via subsurface storage and infiltration within the southwestern StormTech unit.

Runoff volume control storage requirements have been estimated based on full capture of 10mm of runoff from impervious areas as identified below:

Table 5.12: Runoff Volume Control Storage Volumes

Area ID	Impervious Area (ha)	Required Volume (cu.m)	Provided Volume (cu.m)
LID-1	0.001	0.1	38.1
LID-2	0.027	2.7	15.0
LID-3	0.012	1.2	31.2
ROOF1-3, GRN1-3, RAMP, CB-2, CSTRN	0.624	62.4	150.0

As a further check, the 25mm event noted within the OSDG was used to model the proposed SWM features within PCSWMM. Based on results of the PCSWMM model, no site outflows are noted for the 25mm design storm event, demonstrating adequate storage has been provided onsite to detain runoff from the 10mm event.

6 Grading and Drainage

The proposed re-development site measures approximately 1.04 ha in area. The existing topography across the site is relatively sloped, and currently drains from south to north, with overland flow generally being directed to the edge of the existing multi-use pathway in the Byron Tramway Linear Park.

A detailed grading plan (see **Drawing GP-1 and GP-2**) has been prepared to satisfy the stormwater management requirements, as detailed in **Section 5**, allow for positive drainage away from the face of proposed buildings, and provide for minimum cover requirements for storm and sanitary sewers where possible. Site grading has been established to provide emergency overland flow routes required for stormwater management in accordance with City of Ottawa requirements. No grade raise restriction has been identified for this site.

The subject site is graded to provide an emergency overland flow route to Regina Street and the Byron Linear Tramway Park for storm flows exceeding those generated by the 100-year design storm as per existing conditions.

7 Utilities

Hydro Ottawa has existing utility plant in the area, which will be used to service the site. An overhead (OH) hydro-wire run east-west parallel to Regina Street from Lincoln Heights Road and terminates right at the west property line of the site. The existing utility poles within proximity to the site are to be protected during construction.

As the site is surrounded by existing residential and commercial development, Hydro Ottawa, Bell, Rogers, and Enbridge servicing is readily available through existing infrastructure to service this site. The exact size, location, and routing of utilities will be finalized after design circulation. Existing overhead wires and utility plants may need to be temporarily moved/reconfigured to allow sufficient clearance for the movement of heavy machinery required for construction. The relocation of existing utilities will be coordinated with the individual utility providers upon design circulation.

8 Approvals and Permits

Ontario Ministry of Environment, Conservation and Parks (MECP) Environmental Compliance Approvals (ECAs, formerly Certificates of Approval (CofA)) under the Ontario *Water Resources Act* are not anticipated for the proposed storm and sanitary sewers servicing the proposed site so long as the development remains under singular ownership, to be filed if required at time of severance. Modifications to the sanitary sewer off-site within Regina Street are to be incorporated within the City of Ottawa's CLI-ECA.

For ground or surface water volumes being pumped during the construction phase, typically between 50,000 to 400,000 L/day, it is required to register on the Environmental Activity and Sector Registry (EASR). It is possible that groundwater may be encountered during the foundation excavation on this site. A minimum of two to four weeks should be allotted for completion of the EASR registration and the preparation of the Water Taking and Discharge Plan by a Qualified Person as stipulated under O.Reg. 63/16. An MECP Permit to Take Water (PTTW), which is required for dewatering volumes exceeding 400,000L/day, is not anticipated for the site.

9 Erosion Control During Construction

To protect downstream water quality and prevent sediment build up in catch basins and storm sewers, as well as ensuring no further siltation and erosion of the adjacent National Capital Commission (NCC) lands, during construction, erosion and sediment control measures must be implemented during construction. The following recommendations will be included in the contract documents and communicated to the Contractor.

1. Implement best management practices to provide appropriate protection of the existing and proposed drainage system and the receiving water course(s).
2. Limit the extent of the exposed soils at any given time.
3. Re-vegetate exposed areas as soon as possible.
4. Minimize the area to be cleared and grubbed.
5. Protect exposed slopes with geotextiles, geogrid, or synthetic mulches.
6. Install silt barriers/fencing around the perimeter of the site to prevent the migration of sediment offsite.
7. Install track out control mats (mud mats) at the entrance/egress as shown in **Drawing ECDS-1** to prevent migration of sediment into the public ROW.
8. Provide sediment traps and basins during dewatering works.
9. Install sediment traps (such as SiltSack® by Terrafix) between catch basins and frames.
10. Schedule the construction works at times which avoid flooding due to seasonal rains.

The Contractor will also be required to complete inspections and guarantee the proper performance of their erosion and sediment control measures at least after every rainfall. The inspections are to include:

- Verification that water is not flowing under silt barriers.
- Cleaning and changing the sediment traps placed on catch basins.

Refer to **Drawing ECDS-1** for the proposed location of silt fences, sediment traps, and other erosion control measures.

10 Geotechnical Investigation

A geotechnical investigation report was prepared by Paterson Group on August 18, 2021, and revised on June 13, 2025, to provide an assessment of the subsurface conditions found at the site. Seven (7) boreholes, numbered BH 1-21 to BH 7-21, were advanced to a maximum depth of 17.5 metres below the existing ground surface in the investigation carried out from July 29 to August 3, 2021. The information obtained from the field investigation will guide the design of the site and identify development constraints.

The subsurface profile at the test hole locations consists of a topsoil layer underlain by an approximate 0.8 to 1.8 m thick fill layer. The fill material was generally observed to consist of brown silty sand and/or clay with gravel, cobbles, boulders and varying amounts of topsoil and organics. The fill was observed to be underlaid with a hard to very stiff brown silty clay deposit, which was underlaid by a glacial till deposit.

Based on available geological mapping, the bedrock consists of Paleozoic shale of the Rockcliffe formation. Bedrock was cored at borehole BH 1-21, where grey quartz sandstone was encountered at 13.8 to 17.5 m BGS and found to be of very poor to fair quality. Based on groundwater level readings obtained from the monitoring wells installed at boreholes BH 1-21, BH 6-21 and BH 7-21 and the meters installed at the remaining boreholes, the long-term groundwater level is anticipated at a depth of approximately 4 to 5 m below ground surface. However, as groundwater levels are subject to seasonal fluctuations, they could vary at the time of construction.

Based on Paterson's recommendations, the site is considered suitable for the proposed development. It is recommended that the proposed high-rise buildings be founded on a raft foundation placed on an undisturbed, compact to dense glacial till bearing surface. Furthermore, it is recommended that the low-rise building and portions of the underground parking levels be supported on a conventional spread footings bearing on undisturbed compact to dense glacial till.

The recommended rigid pavement structure is further presented in **Table 10.1** below.

Table 10.1: Recommended Pavement Structure

Material	Lower Parking Level	Car Only Parking Areas	Access Lanes and Heavy Loading Parking Areas
Exposure Class C2 – 32 MPa Concrete (5 to 8 % Air Entrainment)	125 mm	-	-
Wear Course – HL-3 or Superpave 12.5 Asphaltic Concrete	-	50 mm	40 mm
Wear Course – HL-8 or Superpave 19.0 Asphaltic Concrete	-	-	50 mm
BASE – OPSS Granular A Crushed Stone	300 mm	150 mm	150 mm
SUBBASE – OPSS Granular B Type II	-	300 mm	300 mm

Refer to the full geotechnical report attached in the submission package for further details.

11 Conclusions

11.1 Water Servicing

Based on the supplied boundary conditions for existing watermains and calculated domestic and fire flow demands for the subject site, the adjacent watermains on Regina Street and Lincoln Heights Road has sufficient capacity to sustain both the required domestic and emergency fire flow demands for the development. Booster pump(s) are required to provide adequate pressures to the towers' upper stories. The proposed development will be serviced by a 200 mm diameter watermain network feeding into the Regina Street and Lincoln Heights Road watermains for looping and redundancy. Two new fire hydrants are proposed on site to provide the needed fire flow demands. Sizing of the water service and requirements for booster pump(s) are to be confirmed by the mechanical consultant.

11.2 Wastewater Servicing

The proposed sanitary sewer servicing for the si8te will consist of sanitary service laterals, sanitary sump pit, and sump pump(s) directing wastewater through a new 300 mm diameter sanitary sewer on site to the existing 375 mm diameter sanitary sewer on Regina Street and Lincoln Heights Road. The City has confirmed that the Lincoln Heights Pumping Station is scheduled for upgrades, with a target completion date of early 2026, to accept the peak sanitary flows from the proposed development. Existing connections are to be abandoned, and full port backwater valves installed on the proposed sanitary service within the site to prevent any surcharge from the downstream sewer main from impacting the proposed property. A sump pump will be required for sewage discharge from the mechanical room. Sizing of the service lateral, sump pit, and sump pump are to be confirmed by the mechanical consultant.

11.3 Stormwater Management and Servicing

The proposed stormwater management plan follows local and provincial standards. Rooftop storage with controlled roof drains, green roof, and surface/subsurface storage via LID feature located north of the underground parking area has been proposed to limit peak storm sewer inflows to the existing 300 mm diameter storm sewers along Regina Street ROW to the required pre-development levels.

11.4 Grading

Grading for the site has been designed to provide an emergency overland flow route as per City requirements and reflects recommendations in the Geotechnical Investigation Report prepared by Paterson Group Inc. in August 2021 (Revised 2025). Erosion and sediment control measures will be implemented during construction to reduce the impact on existing facilities.

11.1 Erosion and Sediment Control During Construction

Erosion and sediment control measures and best management practices outlined in this report and included in the drawing set, will be implemented during construction to reduce the impact on adjacent properties, the public ROW, and existing facilities.

11.2 Utilities

Hydro Ottawa has existing utility plant in the area, which will be used to service the site. The detailed design of the required utility services will be further investigated as part of the composite utility planning process, which will follow design circulation for the servicing plans. The relocation of existing utilities in conflict with the proposed development will be coordinated with the individual utility providers as part of the site plan approval process.

11.3 Approvals and Permits

This site may be subjected to the Ministry of the Environment, Conservation and Parks (MECP) Environmental Compliance Approval (ECA) process for modifications to the sanitary sewer within Regina Street. For the expected dewatering needs of 50,000 to 400,000 L/day, the proponent will need to register on the MECP's Environmental Activity and Sector Registry (EASR). A Permit to Take Water, for dewatering needs in excess of 400,000 L/day, is not anticipated for this site.

Appendices

Appendix A Background Information

A.1 Site Plan

OTTAWA PARKWAY HOUSE

WINDMILL DEVELOPMENT GROUP

PROPERTY IDENTIFICATION NUMBER: 04282-0673(LT)
2475 REGINA ST, OTTAWA, ON K2B 6X3

A PLANNED **ONE PLANET LIVING** COMMUNITY WITH GUIDING THEMES OF YEAR-ROUND NATURAL CONNECTIONS, ZERO CARBON LIVING, WELCOMING AND INCLUSIVE COMMUNITY.

diamond schmitt

Issued

No.	Date	Description
1	22-05-13	Issued for ZBA
2	22-10-21	Issued for ZBA Resubmission
4	24-03-08	Issued for Site Plan Control Phase 2
5	24-03-08	Issued for Schematic Design
6	24-11-22	Issued for Site Plan Control
7	24-12-16	Issued for Permit Phase 2
8	25-02-05	Issued for 30% CD
9	25-02-12	Issued for SPC Resubmission
10	25-04-16	Issued for 60% CD

ELEVATION NOTES

1. PROPERTY BOUNDRY AND TOPOGRAPHIC INFORMATION DERIVED FROM TOPOGRAPHIC SKETCH OF PART OF LOT 23 CONCESSION 1 (OTTAWA FRONT), CITY OF OTTAWA, PREPARED BY STANTEC GEOMETICS LTD. REFER TO SURVEY DRAWING.
2. ELEVATION SHOWN HEREON ARE GEODETIC (CGVD-1928:1978) AND ARE DERIVED FROM THE CAN-NET VRS NETWORK MONUMNET: OTTAWA ELEVATION=95.230

NOT FOR CONSTRUCTION

Contractor Must Check & Verify all Dimensions on the Job.

Do Not Scale Drawings.

This Drawing is Not to be Used for Construction Until Signed by the Architect.

Architect
DIAMOND SCHMITT ARCHITECTS
384 ADELAIDE STREET WEST, SUITE 100
TORONTO, ON M5V 1R7
T: (416) 862-8800

Client
WINDMILL DEVELOPMENTS
150 ELGIN, SUITE 1000
OTTAWA ON K2P 1L4
T: 613-820-5600

Civil
STANTEC
1331 CLYDE AVE, 300
OTTAWA ON K2C 3G4
T: 613-722-4420

Landscape
STANTEC
1331 CLYDE AVE, 300
OTTAWA ON K2C 3G4
T: 613-722-4420

Planning
GBA
1339 WELLINGTON ST W, SUITE 204
OTTAWA ON K1Y 3B8
T: 613-680-9450

Transportation Planning
CGH TRANSPORTATION INC.
6 PLAZA COURT
OTTAWA ON K2H 7W1
T: 613-697-3797

Electrical
SMITH + ANDERSEN
1600 CARLING AVE, 530
OTTAWA ON K1Z 1G3
T: 613-230-1186

Mechanical
SMITH + ANDERSEN
1600 CARLING AVE, 530
OTTAWA ON K1Z 1G3
T: 613-230-1186

Structural
ENTUITIVE
135 LAURIER AVE WEST
OTTAWA ON K1P 5J2
T: 343-308-9274

Environmental
PATERSON GROUP
28 CONCOURSE GATE, UNIT 1
OTTAWA ON K2E 7T7
T: 613-226-7381

Wind
GRADIENT WIND ENGINEERING INC.
127 WALGREEN RD
OTTAWA ON K0A 1L0
T: 613-836-0934

Noise
GRADIENT WIND ENGINEERING INC.
127 WALGREEN RD
OTTAWA ON K0A 1L0
T: 613-836-0934

Energy Modeling
EQ BUILDING PERFORMANCE
20 FLORAL PARKWAY
CONCORD ON L4K 4R1
T: 416-645-1186

OTTAWA PARKWAY
2475 Regina St Ottawa, ON K2B 6X3
211005

D07-12-24-0161
PLAN # 19267

SITE PLAN
As indicated

A010

OTTAWA PARKWAY HOUSE

WINDMILL DEVELOPMENT GROUP

PROPERTY IDENTIFICATION NUMBER: 04282-0673(LT)
2475 REGINA ST, OTTAWA, ON K2B 6X3

A PLANNED **ONE PLANET LIVING** COMMUNITY WITH GUIDING THEMES OF YEAR-ROUND NATURAL CONNECTIONS, ZERO CARBON LIVING, WELCOMING AND INCLUSIVE COMMUNITY.

diamond schmitt

Issued

No.	Date	Description
9	25-02-12	Issued for SPC Resubmission
10	25-04-16	Issued for 60% CD

ELEVATION NOTES

1. PROPERTY BOUNDRY AND TOPOGRAPHIC INFORMATION DERIVED FROM TOPOGRAPHIC SKETCH OF PART OF LOT 23 CONCESSION 1 (OTTAWA FRONT), CITY OF OTTAWA, PREPARED BY STANTEC GEOMETICS LTD. REFER TO SURVEY DRAWING.
2. ELEVATION SHOWN HEREON ARE GEODETIC (CGVD-1928:1978) AND ARE DERIVED FROM THE CAN-NET VRS NETWORK MONUMNET: OTTAWA ELEVATION=95.230

NOT FOR CONSTRUCTION

Architect
DIAMOND SCHMITT ARCHITECTS
384 ADELAIDE STREET WEST, SUITE 100
TORONTO, ON M5V 1R7
T: (416) 862-8800

Client
WINDMILL DEVELOPMENTS
150 ELGIN, SUITE 1000
OTTAWA ON K2P 1L4
T: 613-820-5600

Civil
STANTEC
1331 CLYDE AVE, 300
OTTAWA ON K2C 3G4
T: 613-722-4420

Landscape
STANTEC
1331 CLYDE AVE, 300
OTTAWA ON K2C 3G4
T: 613-722-4420

Planning
GBA
1339 WELLINGTON ST W, SUITE 204
OTTAWA ON K1Y 3B8
T: 613-680-9450

Transportation Planning
CGH TRANSPORTATION INC.
6 PLAZA COURT
OTTAWA ON K2H 7W1
T: 613-697-3797

Electrical
SMITH + ANDERSEN
1600 CARLING AVE, 530
OTTAWA ON K1Z 1G3
T: 613-230-1186

Mechanical
SMITH + ANDERSEN
1600 CARLING AVE, 530
OTTAWA ON K1Z 1G3
T: 613-230-1186

Structural
ENTUITIVE
135 LAURIER AVE WEST
OTTAWA ON K1P 5J2
T: 343-308-9274

Environmental
PATERSON GROUP
28 CONCOURSE GATE, UNIT 1
OTTAWA ON K2E 7T7
T: 613-226-7381

Win
d
GRADIENT WIND ENGINEERING INC.
127 WALGREEN RD
OTTAWA ON K0A 1L0
T: 613-836-0934

Noise
GRADIENT WIND ENGINEERING INC.
127 WALGREEN RD
OTTAWA ON K0A 1L0
T: 613-836-0934

Energy Modeling
EQ BUILDING PERFORMANCE
20 FLORAL PARKWAY
CONCORD ON L4K 4R1
T: 416-645-1186

OTTAWA PARKWAY
2475 Regina St Ottawa, ON K2B 6X3
211005

D07-12-24-0161
PLAN # 19267

SITE PLAN PHASE I
As indicated

A011

diamond schmitt

Issued

No.	Date	Description
1	22-05-13	Issued for ZBA
2	22-10-21	Issued for ZBA Resubmission
4	24-03-08	Issued for Site Plan Control Phase 2
5	24-03-08	Issued for Schematic Design
6	24-11-22	Issued for Site Plan Control
7	24-12-16	Issued for Permit Phase 2
8	25-02-05	Issued for 30% CD
9	25-02-12	Issued for SPC Resubmission
10	25-04-16	Issued for 60% CD

GENERAL NOTES - PLANS:

1. REFER TO BUILDING ELEMENTS SCHEDULE FOR EXTERIOR WALL, PARTITION, ROOF, CEILING AND SOFFIT TYPES.
2. REFER TO MECHANICAL AND ELECTRICAL DRAWINGS FOR ADDITIONAL REQUIREMENTS.
3. AT LOCATIONS WHERE MECH. DUCTS INTERFERE WITH FULL HEIGHT CONSTRUCTION OF INTERIOR PARTITIONS, OFFSET PARTITION ABOVE CEILING AND BRACE AS REQUIRED. MAINTAIN FIRE SEPARATION/SOUND RATING OF PARTITION. OFFSETTING OF PARTITIONS WILL ONLY BE PERMITTED WHERE DUCTWORK CANNOT BE POSITIONED.
4. ALL DIMENSIONS ARE TAKEN TO FACE OF MASONRY OR CONCRETE AT MASONRY AND CONCRETE WALLS AND PARTITIONS. AT STEEL STUD PARTITIONS, DIMENSIONS ARE TAKEN TO FACE OF GYPSUM BOARD, UNLESS OTHERWISE NOTED.
5. INCREASE THICKNESS OF WALLS OR FURR OUT WALL THICKNESS AS REQUIRED TO ACCOMMODATE MECHANICAL AND ELECTRICAL PANELS AND SERVICES. MAINTAIN FIRE SEPARATION AROUND BACK OF PANELS WHERE APPLICABLE.
6. FOR DIMENSIONS OF CONCRETE REFER TO SLAB EDGE DRAWINGS.
7. All AREAS OF EXPOSED SPANDREL PANEL AT INTERIOR OF BUILDING TO BE COVERED WITH FURRING TYPE F14B
8. REFER TO A150 SERIES FOR ENLARGED PLANS.
9. REFER TO INTERIOR DESIGN DRAWINGS FOR ADDITIONAL PARTITIONS THAT MAY BE REQUIRED.

ELEVATION NOTES

1. PROPERTY BOUNDRY AND TOPOGRAPHIC INFORMATION DERIVED FROM TOPOGRAPHIC SKETCH OF PART OF LOT 23 CONCESSION 1 (OTTAWA FRONT), CITY OF OTTAWA, PREPARED BY STANTEC GEOMETICS LTD. REFER TO SURVEY DRAWING.
2. ELEVATION SHOWN HEREON ARE GEODETIC (CGVD-1928:1978) AND ARE DERIVED FROM THE CAN-NET VRS NETWORK MONUMNET: OTTAWA ELEVATION=95.230

NOT FOR CONSTRUCTION

OTTAWA PARKWAY
2475 Regina St Ottawa, ON K2B 6X3
211005

D07-12-24-0161
PLAN # 19267

LEVEL 1 FLOOR PLAN
1 : 200

A101

A.2 Pre-Consultation

Wu, Michael

From: Tse, Wendy <Wendy.Tse@ottawa.ca>
Sent: December 10, 2021 14:33
To: 'dschmitt@dsai.ca'; 'jonathan.westeinde@windmilldevelopments.com'; 'ross.farris@windmilldevelopments.com'; 'John Moser'; 'Kirsten Beale'; JF Tessier; Stephen Savell; 'andrew.harte@cghtransportation.com'
Cc: Ren, Jeffrey; Nitsche, Kersten; Surprenant, Eric; Wang, Randolph; McMahon, Patrick
Subject: 2475 Regina-pre-consultation follow-up
Attachments: design_brief_submission requirements_2475 Regina.pdf; files checklist-2475 Regina.pdf

Good afternoon all,

Thank you for meeting with City Staff on Nov. 17 to discuss the redevelopment of 2475 Regina Street. It is our understanding the proposed development features the redevelopment of the Parkway House as a one-storey residential and service facility at the southeast corner of the site, two high-rise apartment towers (18 storeys and 24 storeys) with townhouses at the base, as well as two-storey townhouses bordering the northwest portion of the site. Access to the site is to be provided from Regina Steet. Parking to be provided by two levels of a below grade parking garage, with limited surface parking.

The required applications, based on the assumption that the proposal is Official Plan compliant (please see Planning comment below), are the following :
Zoning By-law Amendment (major)-$21,722.94+$115 Conservation Authority (CA) fee
Site Plan Control (complex)-$48,298.80 (Planning and legal)+$10,000 (based on hard and soft servicing >$300,000)+$115 CA fee

Condominium applications may be required depending on the ultimate tenancy.

Note that these are our current fees and the fee applicable at the time of submission will be applied. If the zoning and site plan control applications are submitted concurrently, a 10% discount will be applied.

Our initial comments are the following:

Transportation

1. Follow Traffic Impact Assessment Guidelines
   - Please proceed with scoping.
   - The application will not be deemed complete until the submission of the draft step 1-4, including the functional draft RMA package (if applicable) and/or monitoring report (if applicable). Collaboration and communication between development proponents and City staff are required at the end of every step of the TIA process. An update to the TRANS Trip Generation Manual has been completed (October 2020). This manual (attached) is to be utilized for this TIA.
2. Noise Impact Studies required for the following:
   - Road;
   - Rail; and,
   - Stationary if there will be any exposed mechanical equipment due to the proximity to neighbouring noise sensitive land uses.
3. The site is partially within 600m of future Lincoln Fields LRT Station – therefore TOD mode shares should be targeted. To achieve target mode shares within this zone, we highly recommend the provision of as many TDM measures as possible given the longer walking

distance to the station. The connection to Pinecrest Creek pathway through the NCC will be integral in the achievement of these mode shares.

4. There is no parking/stopping along Regina Street in proximity to the proposed development. Ensure that sufficient visitor and bicycle is provided. Due to these conditions, parking spillover may need to be addressed as part of the TIA.
5. Fire routes cannot be encumbered with parking below.

Site plan comments:

6. On site plan:
   - Show all details of the roads abutting the site up to and including the opposite curb; include such items as pavement markings, accesses and/or sidewalks.
   - Turning templates will be required for all accesses showing the largest vehicle to access the site; required for internal movements and at all access (entering and exiting and going in both directions). Consideration should be given to adding on-site short-term delivery/loading areas.
   - Show all curb radii measurements; ensure that all curb radii are reduced as much as possible
   - Show lane/aisle widths.
7. As the site proposed is residential, AODA legislation applies for all areas accessible to the public (i.e. outdoor pathways, parking, etc.).

Urban Design

1. Design brief required, may be combined with Planning Rationale. The Terms of Reference of the Design Brief is attached for convenience.
   a. Please note shadow and wind studies are required.
   b. Please provide multiple views of the proposed development, including the short views from the neighbourhoods and the long views from the parkway.
2. Urban design appreciates the programing and architectural merits of the proposal. However, the proposed development is likely to change to accommodate the required parkland. The following high-level comments are provided based on the current preliminary plan. It is recommended that a second preconsultation be held when a revised preliminary plan is developed.
   a. Transition – Urban design appreciates using low-rise towns as a buffer between the proposed towers and the adjacent low-rise area. However, it is unclear if the proposed location and height of the towers are appropriate to provide transition to the low-rise area. Please study and demonstrate built form transition strategy of the development. Please review the City's Urban Design Guidelines for High-Rise Buildings and use 45 degree angular plane as a tool to guide the development of transition strategy.
   b. Connection –
      i. Urban design appreciates the intent to connect the site to the NCC pathways and the efforts made so far by the applicant with respect to communications with the NCC. Please continue to study and pursue connections and advance conversations with the NCC. It is crucially important to ensure pedestrian connectivity to the pathway system. The NCC pathways are historically designed and developed for recreation purposes. Recent reports on the media have indicated that a big portion of the pathway system has been at capacity. Should considerations be given to increase the capacity of the pathway system around Lincoln Fields transit station to accommodate commuting foot and bike traffic?
      ii. The existing sidewalk along Regina must be extended into the site.

   c. Circulation – Urban design has some concerns on internal vehicular circulation with respect to the deed-end streets. The internal circulation has to be functional for services such as emergency, delivery, garbage pick-up, snow removal in addition to drop-offs and loading. Considerations may be given to the design of a loop.

Parks

1. Pursuant to Policy 7.2 and Table 58 of the recently-approved Parks and Recreation Facilities Master Plan, this site is in an area of the city that is under-served for parkland. As such, parkland dedication will be required at the time of Site Plan Control.
   a. While the parkland dedication will be taken at the time of Site Plan Control, if a stand-alone Zoning By-law Amendment application is submitted, the concept plan must show the parkland dedication at the time of application submission.
2. Based on the density of the site, the parkland dedication will be 10% of the site area (e.g., dedication of 1,035.75 sq.m.)
3. The parkland dedication must be in a location that connects to the existing park (Byron Linear Tramway Park) to the north. The revised development concept must show parkland dedication in a location and configuration on the site that also considers the urban design comments.
4. Lands to be dedicated as parkland cannot be encumbered.
5. Please ensure that the submission includes shadow studies that clearly show the impact on Byron Linear Tramway Park to the north.
6. Please provide further information regarding the setback of the proposed development from the north property line to ensure there are no future impacts for limiting distances, etc. on Byron Linear Tramway Park.

Infrastructure

Water: Boundary Conditions request will be required for this site, Fire Flow requirements through FUS calculations and hydrant coverage will need to be demonstrated.
This site will likely require a second connection for redundancy based on domestic demands and the backbone watermain east of the site is not an option.
The normal operating pressure at the publicly owned watermain (ground elevation) is 57-70psi.

Wastewater: We will need more information as to anticipated wastewater flows. A small lift station exists downstream, and we will require the expected sanitary flows before we can confirm any constraints.

Stormwater Management: Pinecrest Creek Criteria applies to this site. Criteria is as follows:

		over all soft landscaped surfaces.	
Draining to the Ottawa River			
Development subject to Plan of Subdivision or Site Plan Control approval(s) - <u>discharging directly to the Ottawa River</u>			
2	all soil infiltration rates	A minimum on-site retention of the 10 mm design storm; refer to LID references[i] for guidance on prudent approach to planning infiltration-based LID best management practices. Assumptions re: non-viability of infiltration measures must be substantiated. A green roof, rain harvesting measures and/or a combination of detention/retention measures[ii] could be implemented to provide further runoff volume reduction.	On-site remo some of whi by on-site re mm of rainfa
Draining to Pinecrest Creek			
Development subject to Plan of Subdivision or Site Plan Control approval(s) - <u>discharging upstream of the Ottawa River Parkway pipe (ORPP) inlet</u>			
3	all soil infiltration rates	A minimum on-site retention of the 10 mm design storm; refer to LID references[i] for guidance on prudent approach to planning infiltration-based LID best management practices. Assumptions re: non-viability of infiltration measures must be substantiated. A green roof, rain harvesting measures and/or a combination of detention/retention measures[ii] could be implemented to provide further runoff volume reduction.	On-site remo some of whi achieved by of first 10 m detention of storm[iii].

Planning

1. The policies of the Council approved new Official Plan are still to be confirmed. The site is within the Inner Urban Transect, with an Evolving Overlay and a Neighbourhood designation. Taken together, it appears this provides for a low rise built form. However, if you have correspondence with Don Herweyer which indicates otherwise, please provide.
2. List of required plans/studies for concurrent as well as separate applications is attached. It would assist in the posting of the reports and plans if they are named as indicated on the list.
3. The Planning Rationale should clearly indicate any zoning relief requested as well as the rationale
4. Note that an archeological study is required as a portion of the site has been identified as having archeological potential.
5. Site plan comments:

- Section 136 of the Zoning By-law limits the number of townhouse dwellings in a single row to eight.
- Please show any existing/proposed fencing/buffering on the landscaping plan. Where none currently exist, it should be provided.
- Please consider improving the internal pedestrian connections. There is an existing sidewalk along the north side of Regina Street which should extend into site, implement an internal walkway system.
- How will garbage/recycling from the townhome units be handled? Refer to Section 143 of the Zoning By-law.
- Indicate snow storage areas
- Please ensure that the zoning provisions related to amenity areas are being met. Refer to Section 137 of Zoning By-law
- Indicate fire route and location of required ‘no parking’ signs

As suggested by Urban Design, and taking into account Parks comments, if you would like to meet again once the plans have been amended, please contact me.

Please let me know if there are any questions related to the above.

Thank you.
Wendy

Wendy Tse, MCIP, RPP, LEED GA
Planner III (A)/ Urbaniste III (i)
Development Review /Examen des demandes d'aménagement

Planning, Infrastructure and Economic Development Department/
Services de la planification, de l'infrastructure et du développement économique

City of Ottawa/ Ville d'Ottawa
110, avenue Laurier Avenue West / Ouest, 4th Floor / 4ième étage
Ottawa, ON K1P 1J1

Tel. : 613-580-2424 ext. 12585
E-mail / Courriel : wendy.tse@ottawa.ca
Mail Code: 01-14

'

'

A.3 Correspondence with Architect on Building Construction

Wu, Michael

From: Bennet Hu <BHu@dsai.ca>
Sent: February 29, 2024 16:39
To: Wu, Michael
Cc: Thiffault, Dustin; Moroz, Peter
Subject: Re: Parkway House (2475 Regina Street) Building Construction Type Confirmation

You don't often get email from bhu@dsai.ca. Learn why this is important

Hi Michael,

_The two towers on site will be concrete structures, the 7-storey will be hybrid with concrete structure for ground floor and cores with mass timber structure above.
_All buildings will have rated separation from floor to floor and protection at the vertical openings per NBC.
_All building will be sprinklered.

Hope that helps. Let me know if you have any other questions.

Thanks,
Bennet

From: Wu, Michael <Michael.Wu@stantec.com>
Sent: Thursday, February 29, 2024 3:26 PM
To: Bennet Hu <BHu@dsai.ca>
Cc: Thiffault, Dustin <Dustin.Thiffault@stantec.com>; Moroz, Peter <peter.moroz@stantec.com>
Subject: Parkway House (2475 Regina Street) Building Construction Type Confirmation

Good afternoon, Bennet, hope all is well:

For detailed design phase, I was wondering if you could reconfirm the following information for the proposed buildings at 2475 Regina Street? We would need them for requesting the updated hydraulic boundary conditions from the City.

1. Construction type.
2. Confirmation that the vertical openings (between floors) are going to be **protected** per the fire code requirements outlined in the Ontario and National Building Codes and whether the building will be sprinklered.

Thanks,

Michael Wu EIT
Civil Engineering Intern, Community Development

Direct: 1 (613) 738-6033
Michael.Wu@stantec.com

Stantec
300-1331 Clyde Avenue
Ottawa ON K2C 3G4

Stantec

Appendix B Water Servicing

B.1 Domestic Water Demands

2475 Regina St., Ottawa, ON - Domestic Water Demand Estimates
Site Plan provided by Diamond Schmitt Architects (2024-11-07)
Project No. 160401689
Unit Breakdown updated by Diamond Schmitt Architects (2024-11-21)
Stantec Project No. 160401689 Designed By MW
Revision Date: 22-Nov-2024 Checked By:
Revision: 01 City File No.:

Densities as per City Guidelines:		
Apartment Units		
1 Bedroom	1.4	ppu
2 Bedroom	2.1	ppu
3 Bedroom	3.1	ppu
LTC Units		
1 Bedroom	1.0	ppu

Stantec

Building ID	No. of Units	Population	Daily Rate of Demand [1] (L/cap/day or L/ha/day)	Avg Day Demand		Max Day Demand [2 3]		Peak Hour Demand [2 3]	
				(L/min)	(L/s)	(L/min)	(L/s)	(L/min)	(L/s)
A1									
1 Bedroom	56	78	280	15.2	0.25	38.1	0.64	83.8	1.40
2 Bedroom	19	40	280	7.8	0.13	19.4	0.32	42.7	0.71
3 Bedroom	0	0	280	0.0	0.00	0.0	0.00	0.0	0.00
LTC 1 Bedroom	12	12	400	3.3	0.06	5.0	0.08	9.0	0.15
T1 Apartment Units									
Studio	15	21	280	4.1	0.07	10.2	0.17	22.5	0.37
1 Bedroom	90	126	280	24.5	0.41	61.3	1.02	134.8	2.25
2 Bedroom	59	124	280	24.1	0.40	60.2	1.00	132.5	2.21
3 Bedroom	15	47	280	9.0	0.15	22.6	0.38	49.7	0.83
Total Phase 1:	**266**	**448**		**88.05**	**1.47**	**216.80**	**3.61**	**474.96**	**7.92**
T2 Apartment Units									
Studio	0	0	280	0.0	0.00	0.0	0.00	0.0	0.00
1 Bedroom	170	238	280	46.3	0.77	115.7	1.93	254.5	4.24
2 Bedroom	122	256	280	49.8	0.83	124.5	2.08	274.0	4.57
3 Bedroom	19	59	280	11.5	0.19	28.6	0.48	63.0	1.05
Total Phase 2:	**311**	**553**		**107.55**	**1.79**	**268.87**	**4.48**	**591.51**	**9.86**
Total Site :	**577**	**1001**		**195.6**	**3.3**	**485.7**	**8.1**	**1066.5**	**17.8**

1 Average day water demand for residential areas: 280 L/cap/d

2 The City of Ottawa water demand criteria used to estimate peak demand rates for residential areas are as follows:
maximum day demand rate = 2.5 x average day demand rate
peak hour demand rate = 2.2 x maximum day demand rate (as per Technical Bulletin ISD-2010-02)

3 Water demand criteria used to estimate peak demand rates for long-term care units based on commercial areas and are as follows:
maximum daily demand rate = 1.5 x average day demand rate
peak hour demand rate = 1.8 x maximum day demand rate (as per Technical Bulletin ISD-2010-02)

B.2 Fire Flow Demands (2020 FUS)

Stantec

FUS Fire Flow Calculation Sheet - 2020 FUS Guidelines

Stantec Project #: 160401689
Project Name: 2475 Regina Street
Date: 2024-11-27
Fire Flow Calculation #: 1
Description: Residential

Notes: 7-storey building with amenities. Information taken from Site plan by Diamond Schmitt Architects dated November 8, 2024.

Step	Task	Notes										Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Type II - Noncombustible Construction / Type IV-A - Mass Timber Construction										0.8	-
2	Determine Effective Floor Area	Sum of Largest Floor + 25% of Two Additional Floors					Vertical Openings Protected?					YES	-
		1164	1164	1164	1164	1164	1164	1164				1746	-
3	Determine Required Fire Flow	(F = 220 x C x $A^{1/2}$). Round to nearest 1000 L/min										-	7000
4	Determine Occupancy Charge	Limited Combustible										-15%	5950
5	Determine Sprinkler Reduction	Conforms to NFPA 13										-30%	-2975
		Standard Water Supply										-10%	
		Fully Supervised										-10%	
		% Coverage of Sprinkler System										100%	
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall		Firewall / Sprinklered ?			-	-
		North	> 30	0	0	0-20	Type V		NO			0%	833
		East	10.1 to 20	7	7	41-60	Type I-II - Protected Openings		YES			0%	
		South	10.1 to 20	21	7	> 100	Type I-II - Protected Openings		YES			0%	
		West	10.1 to 20	43	2	81-100	Type V		NO			14%	
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min											4000
		Total Required Fire Flow in L/s											66.7
		Required Duration of Fire Flow (hrs)											1.50
		Required Volume of Fire Flow (m^3)											360

FUS Fire Flow Calculation Sheet - 2020 FUS Guidelines

Stantec Project #: 160401689
Project Name: 2475 Regina Street
Date: 2024-11-27
Fire Flow Calculation #: 2
Description: Residential

Notes: 16-storey building with amenities. Information taken from Site plan by Diamond Schmitt Architects dated November 8, 2024.

Step	Task	Notes										Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Type II - Noncombustible Construction / Type IV-A - Mass Timber Construction										0.8	-
2	Determine Effective Floor Area	Sum of Largest Floor + 25% of Two Additional Floors					Vertical Openings Protected?					YES	-
		800	800	800	738	800	800	800	800	800	800	1200	-
3	Determine Required Fire Flow	(F = 220 x C x $A^{1/2}$). Round to nearest 1000 L/min										-	6000
4	Determine Occupancy Charge	Limited Combustible										-15%	5100
5	Determine Sprinkler Reduction	Conforms to NFPA 13										-30%	-2550
		Standard Water Supply										-10%	
		Fully Supervised										-10%	
		% Coverage of Sprinkler System										100%	
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall		Firewall / Sprinklered ?			-	-
		North	10.1 to 20	20	7	> 100	Type I-II - Protected Openings		YES			0%	0
		East	20.1 to 30	42	16	> 100	Type I-II - Protected Openings		YES			0%	
		South	> 30	0	0	0-20	Type V		NO			0%	
		West	> 30	0	0	0-20	Type V		NO			0%	
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min											3000
		Total Required Fire Flow in L/s											50.0
		Required Duration of Fire Flow (hrs)											1.25
		Required Volume of Fire Flow (m^3)											225

Stantec

FUS Fire Flow Calculation Sheet - 2020 FUS Guidelines

Stantec Project #: 160401689
Project Name: 2475 Regina Street
Date: 2024-11-27
Fire Flow Calculation #: 3
Description: Residential

Notes: 28-storey building with amenities. Information taken from Site plan by Diamond Schmitt Architects dated November 8, 2024.

Step	Task	Notes										Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Type II - Noncombustible Construction / Type IV-A - Mass Timber Construction										0.8	-
2	Determine Effective Floor Area	Sum of Largest Floor + 25% of Two Additional Floors					Vertical Openings Protected?					YES	-
		1178	1178	1178	1106	1178	1178	1178	1046	915	784	1767	-
3	Determine Required Fire Flow	(F = 220 x C x $A^{1/2}$). Round to nearest 1000 L/min										-	7000
4	Determine Occupancy Charge	Limited Combustible										-15%	5950
5	Determine Sprinkler Reduction	Conforms to NFPA 13										-30%	-2975
		Standard Water Supply										-10%	
		Fully Supervised										-10%	
		% Coverage of Sprinkler System										100%	
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall		Firewall / Sprinklered ?			-	-
		North	> 30	0	0	0-20	Type V		NO			0%	238
		East	> 30	0	0	0-20	Type V		NO			0%	
		South	20.1 to 30	20	17	> 100	Type I-II - Unprotected Openings		NO			4%	
		West	10.1 to 20	7	7	41-60	Type I-II - Protected Openings		YES			0%	
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min											3000
		Total Required Fire Flow in L/s											50.0
		Required Duration of Fire Flow (hrs)											1.25
		Required Volume of Fire Flow (m^3)											225

B.3 Boundary Conditions

Wu, Michael

From: Schaeffer, Gabrielle <gabrielle.schaeffer@Ottawa.ca>
Sent: March 22, 2024 17:08
To: Wu, Michael
Cc: Thiffault, Dustin; Moroz, Peter; Surprenant, Eric; Nehzat Khoshamal, Ali
Subject: RE: 2475 Regina Street - Updated Boundary Conditions Request
Attachments: 2475 Regina Street REVISED March 2024.pdf

Hi Michael,

I have spoken with asset management and operations. I have confirmed that there will be 8 L/s available once the updates to the lift station are completed. The full 10.1 L/s requested cannot be accommodated. My understanding is that the capacity increase will come from contributions made by 2475 Regina Street via a third-party infrastructure agreement with the City, which needs to be coordinated. Operations has indicated the target completion date for the lift station upgrades is early 2026.

Water boundary conditions are below:

The following are boundary conditions, HGL, for hydraulic analysis at 2475 Regina Street (zone 1W) assumed a 203mm looped private network to be connected to the 203 mm watermain on 2475 Regina Street and the 203 mm on Lincoln Heights Road (see attached PDF for location).

Both Connections
Minimum HGL: 108.3 m
Maximum HGL: 115.8 m

Connection 1 (Regina):
Max Day + Fire Flow (166.7 L/s): 86.6 m

Connection 2 (Lincoln Heights):
Max Day + Fire Flow (166.7 L/s): 93.8 m

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

Regards,

Gabrielle (Gabi) Schaeffer, P.Eng
Senior Engineer - Infrastructure Applications

City of Ottawa
Development Review - West Branch
Planning, Real Estate and Economic Development Department
110 Laurier Ave West, 4th Floor East;
Ottawa ON K1P 1J1
Tel: 613-580-2424 x 22517
Cell: 613-227-7419

From: Schaeffer, Gabrielle
Sent: March 19, 2024 11:18 AM
To: Wu, Michael <Michael.Wu@stantec.com>
Cc: Thiffault, Dustin <dustin.thiffault@stantec.com>; Moroz, Peter <peter.moroz@stantec.com>; Surprenant, Eric <Eric.Surprenant@ottawa.ca>; Nehzat Khoshamal, Ali <ali.nehzatkhoshamal@ottawa.ca>
Subject: RE: 2475 Regina Street - Updated Boundary Conditions Request

Hi Michael,

Ali, cc'd, will get back to you on the sanitary capacity question. With respect to the boundary conditions, we expect to receive it back from Infrastructure Planning by mid-next week or earlier.

Regards,
Gabrielle (Gabi) Schaeffer, P.Eng
Senior Engineer - Infrastructure Applications

City of Ottawa
Development Review - West Branch
Planning, Real Estate and Economic Development Department
110 Laurier Ave West, 4th Floor East;
Ottawa ON K1P 1J1
Tel: 613-580-2424 x 22517
Cell: 613-227-7419

From: Wu, Michael <Michael.Wu@stantec.com>
Sent: March 19, 2024 10:38 AM
To: Surprenant, Eric <Eric.Surprenant@ottawa.ca>
Cc: Thiffault, Dustin <dustin.thiffault@stantec.com>; Moroz, Peter <peter.moroz@stantec.com>; Schaeffer, Gabrielle <gabrielle.schaeffer@Ottawa.ca>
Subject: RE: 2475 Regina Street - Updated Boundary Conditions Request

Good morning, Eric:

As a quick follow-up, is there a timeline on when we can expect the updated boundary conditions and the confirmation on the downstream sanitary sewer capacity?

Thanks,

Michael Wu EIT
Civil Engineering Intern, Community Development

Direct: 1 (613) 738-6033
Michael.Wu@stantec.com

Stantec
300-1331 Clyde Avenue
Ottawa ON K2C 3G4

The content of this email is the confidential property of Stantec and should not be copied, modified, retransmitted, or used for any purpose except with Stantec's written authorization. If you are not the intended recipient, please delete all copies and notify us immediately.

From: Moroz, Peter <peter.moroz@stantec.com>
Sent: Wednesday, March 13, 2024 8:39 AM
To: Schaeffer, Gabrielle <gabrielle.schaeffer@ottawa.ca>; Surprenant, Eric <Eric.Surprenant@ottawa.ca>
Cc: Thiffault, Dustin <Dustin.Thiffault@stantec.com>; Wu, Michael <Michael.Wu@stantec.com>
Subject: RE: 2475 Regina Street - Updated Boundary Conditions Request

Thank you!

Peter

Peter Moroz P.Eng., MBA
Managing Principal, Community Development

Stantec
300 - 1331 Clyde Avenue Ottawa ON K2C 3G4
Cell: (613) 294-2851

peter.moroz@stantec.com

From: Schaeffer, Gabrielle <gabrielle.schaeffer@Ottawa.ca>
Sent: Tuesday, March 12, 2024 4:41 PM
To: Moroz, Peter <peter.moroz@stantec.com>; Surprenant, Eric <Eric.Surprenant@ottawa.ca>
Cc: Thiffault, Dustin <Dustin.Thiffault@stantec.com>; Wu, Michael <Michael.Wu@stantec.com>
Subject: RE: 2475 Regina Street - Updated Boundary Conditions Request

Hi Peter,

I just spoke with Eric. He will be completing your boundary condition request. As for who will be the new PM on the file, I will reassign someone when a submission comes in. If you need to discuss with someone now for a specific reason, let me know.

Thanks,
Gabi

From: Moroz, Peter <peter.moroz@stantec.com>
Sent: March 12, 2024 4:19 PM
To: Surprenant, Eric <Eric.Surprenant@ottawa.ca>
Cc: Thiffault, Dustin <dustin.thiffault@stantec.com>; Wu, Michael <Michael.Wu@stantec.com>; Schaeffer, Gabrielle <gabrielle.schaeffer@Ottawa.ca>
Subject: RE: 2475 Regina Street - Updated Boundary Conditions Request

Sounds good, thank you.

Peter

Peter Moroz P.Eng., MBA

Managing Principal, Community Development

Stantec
300 - 1331 Clyde Avenue Ottawa ON K2C 3G4
Cell: (613) 294-2851

peter.moroz@stantec.com

From: Surprenant, Eric <Eric.Surprenant@ottawa.ca>
Sent: Tuesday, March 12, 2024 4:18 PM
To: Moroz, Peter <peter.moroz@stantec.com>
Cc: Thiffault, Dustin <Dustin.Thiffault@stantec.com>; Wu, Michael <Michael.Wu@stantec.com>; Schaeffer, Gabrielle <gabrielle.schaeffer@ottawa.ca>
Subject: Re: 2475 Regina Street - Updated Boundary Conditions Request

Hi Peter,
Thanks for this, I am copying Gabrielle on this as she will let you know who will follow up on this.

Thanks,

Eric Surprenant
Sr Project Manager. Infrastructure Projects (T)
Infrastructure & Water Services Dept.
613 580-2424 x27794

Note:

From: Moroz, Peter <peter.moroz@stantec.com>
Sent: March 12, 2024 16:12
To: Surprenant, Eric <Eric.Surprenant@ottawa.ca>
Cc: Thiffault, Dustin <dustin.thiffault@stantec.com>; Wu, Michael <Michael.Wu@stantec.com>
Subject: RE: 2475 Regina Street - Updated Boundary Conditions Request

Hi Eric, let us know if there is another contact for this project going forward. We assume that it will be you given your previous involvement, but I know there were some recent changes at the City. Let us know.

thx

Peter

Peter Moroz P.Eng., MBA
Managing Principal, Community Development

Stantec
300 - 1331 Clyde Avenue Ottawa ON K2C 3G4
Cell: (613) 294-2851

peter.moroz@stantec.com

From: Wu, Michael <Michael.Wu@stantec.com>
Sent: Tuesday, March 12, 2024 4:07 PM

To: Surprenant, Eric <Eric.Surprenant@ottawa.ca>
Cc: Moroz, Peter <peter.moroz@stantec.com>; Thiffault, Dustin <Dustin.Thiffault@stantec.com>
Subject: RE: 2475 Regina Street - Updated Boundary Conditions Request

Good afternoon, Eric, hope you are well.

Just wanted to do a quick follow-up on the updated boundary condition request for the Parkway House development and when we can expect the updated boundary conditions.

As well, we would like to request confirmation on whether the downstream sanitary sewers on Regina Street and Lincoln Heights Road has the capacity to take in an additional 10.1 L/s of sanitary peak flows from the site.

Attached is the sanitary calculation sheet for your information.

Thanks,

Michael Wu EIT
Civil Engineering Intern, Community Development

Direct: 1 (613) 738-6033
Michael.Wu@stantec.com

Stantec
300-1331 Clyde Avenue
Ottawa ON K2C 3G4

From: Wu, Michael
Sent: Friday, March 1, 2024 12:13 PM
To: Surprenant, Eric <Eric.Surprenant@ottawa.ca>
Cc: Moroz, Peter <peter.moroz@stantec.com>; Thiffault, Dustin <Dustin.Thiffault@stantec.com>
Subject: 2475 Regina Street - Updated Boundary Conditions Request

Good afternoon, Eric, hope you are well.

We are requesting updated hydraulic boundary conditions for the proposed Parkway House development at 2475 Regina Street as part of the site plan control application process. The updated site plan will see three blocks of apartment buildings with a total of 567 apartment units and projected to serve 987 residents.

As with our previous boundary condition request, the development would be served by a looped watermain and connected to the existing 203 mm diameter watermains on Regina Street and Lincoln Heights Road.

The updated water demands for the proposed development are as follows:

- Average Day Demand: 3.2 L/s (193 L/min)
- Maximum Day Demand: 8.0 L/s (479.1 L/min)
- Peak Hour Demand: 17.5 L/s (1,051.9 L/min)
- Lower Fire Flow Demand: 66.7 L/s (4,000 L/min)
- Upper Fire Flow Demand for conservative analysis: 166.7 L/s (10,000 L/min)

Attached are the calculation sheets for your reference and location map.

We appreciate your time looking into this for us, and please feel free to reach out to me if you have any more questions or comments.

Best regards,

Michael Wu EIT
Civil Engineering Intern, Community Development

Direct: 1 (613) 738-6033
Michael.Wu@stantec.com

Stantec
300-1331 Clyde Avenue
Ottawa ON K2C 3G4

'

'

'

This e-mail originates from the City of Ottawa e-mail system. Any distribution, use or copying of this e-mail or the information it contains by other than the intended recipient(s) is unauthorized. Thank you.

Le présent courriel a été expédié par le système de courriels de la Ville d'Ottawa. Toute distribution, utilisation ou reproduction du courriel ou des renseignements qui s'y trouvent par une personne autre que son destinataire prévu est interdite. Je vous remercie de votre collaboration.

'

Caution: This email originated from outside of Stantec. Please take extra precaution.

Attention: Ce courriel provient de l'extérieur de Stantec. Veuillez prendre des précautions supplémentaires.

Atención: Este correo electrónico proviene de fuera de Stantec. Por favor, tome precauciones adicionales.

'

'

Appendix C Sanitary Servicing

C.1 Sanitary Design Sheet

Stantec

SUBDIVISION:

2475 Regina Street

DATE: 6/5/2025
REVISION: 5
DESIGNED BY: DT
CHECKED BY:

SANITARY SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160401689
Ultimate Build-Out

DESIGN PARAMETERS

MAX PEAK FACTOR (RES.)=	4.0	AVG. DAILY FLOW / PERSON	280 l/p/day	MINIMUM VELOCITY	0.60 m/s
MIN PEAK FACTOR (RES.)=	2.0	COMMERCIAL	28,000 l/ha/day	MAXIMUM VELOCITY	3.00 m/s
PEAKING FACTOR (INDUSTRIAL):	2.4	INDUSTRIAL (HEAVY)	55,000 l/ha/day	MANNINGS n	0.013
PEAKING FACTOR (ICI >20%):	1.5	INDUSTRIAL (LIGHT)	35,000 l/ha/day	BEDDING CLASS	B
PERSONS / ONE BEDROOM	1.4	INSTITUTIONAL	28,000 l/ha/day	MINIMUM COVER	2.50 m
PERSONS / 2 BEDROOM	2.1	INFILTRATION	0.33 l/s/Ha	HARMON CORRECTION FACTOR	0.8
PERSONS / 3 BEDROOM	3.1	PERSONS - LTC ONE BEDROOM	1.0		

LOCATION			RESIDENTIAL AREA AND POPULATION									
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (ha)	UNITS 1 BEDROOM	UNITS 2 BEDROOM	UNITS 3 BEDROOM	LTC 1 BEDROOM	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)
R4A (T2)	SAN 4	SAN 3	0.119	170	122	19		553	0.119	553	3.361	6.0
R2B (T1)	SAN 3	SAN 1	0.078	105	59	15		317	0.197	871	3.270	9.2
R5A (A1)	SAN 5	SAN 2	0.141	56	19	0	12	130	0.141	130	3.568	1.5
	SAN 2	SAN 1							0.000	0	3.800	0.0
	SAN 1	EX SAN 1A	0.000	0	0		0	0	0.338	1001	3.240	10.5

LOCATION			COMMERCIAL		INDUSTRIAL (L)		INDUSTRIAL (H)		INSTITUTIONAL		GREEN / UNUSED		C+I+I
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)
R4A (T2)	SAN 4	SAN 3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0
R2B (T1)	SAN 3	SAN 1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0
R5A (A1)	SAN 5	SAN 2	0.000	0.000	0.000	0.000	0.000	0.000	0.141	0.141	0.000	0.000	0.1
	SAN 2	SAN 1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0
	SAN 1	EX SAN 1A	0.000	0.000	0.000	0.000	0.000	0.000	0.141	0.141	0.697	0.697	0.1

LOCATION			INFILTRATION			TOTAL	PIPE							
AREA ID NUMBER	FROM M.H.	TO M.H.	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	FLOW (l/s)	LENGTH (m)	DIA (mm)	MATERIAL	CLASS	SLOPE (%)	CAP. (FULL) (l/s)	CAP. V PEAK FLOW (%)	VEL. (FULL) (m/s)
R4A (T2)	SAN 4	SAN 3	0.119	0.119	0.04	6.1	43.0	300	PVC	SDR 35	0.21	44.0	**13.78%**	0.63
R2B (T1)	SAN 3	SAN 1	0.078	0.197	0.07	9.3	16.2	300	PVC	SDR 35	0.25	48.0	**19.35%**	0.68
R5A (A1)	SAN 5	SAN 2	0.141	0.141	0.05	1.6	42.3	200	PVC	SDR 35	0.40	21.1	**7.67%**	0.67
	SAN 2	SAN 1	0.000	0.000	0.00	0.0	13.4	200	PVC	SDR 35	0.40	21.1	**0.00%**	0.67
	SAN 1	EX SAN 1A	0.697	1.036	0.34	10.9	62.2	300	PVC	SDR 35	0.22	45.0	**24.24%**	0.64

C.2 Correspondence with City on Sanitary Sewer Capacity

From: Schaeffer, Gabrielle
To: Wu, Michael
Cc: Thiffault, Dustin; Moroz, Peter; Surprenant, Eric; Nehzat Khoshamal, Ali
Subject: RE: 2475 Regina Street - Updated Boundary Conditions Request
Date: Friday, March 22, 2024 5:09:32 PM
Attachments: 2475 Regina Street REVISED March 2024.pdf

Hi Michael,

I have spoken with asset management and operations. I have confirmed that there will be 8 L/s available once the updates to the lift station are completed. The full 10.1 L/s requested cannot be accommodated. My understanding is that the capacity increase will come from contributions made by 2475 Regina Street via a third-party infrastructure agreement with the City, which needs to be coordinated. Operations has indicated the target completion date for the lift station upgrades is early 2026.

Water boundary conditions are below:

The following are boundary conditions, HGL, for hydraulic analysis at 2475 Regina Street (zone 1W) assumed a 203mm looped private network to be connected to the 203 mm watermain on 2475 Regina Street and the 203 mm on Lincoln Heights Road (see attached PDF for location).

Both Connections
Minimum HGL: 108.3 m
Maximum HGL: 115.8 m

Connection 1 (Regina):
Max Day + Fire Flow (166.7 L/s): 86.6 m

Connection 2 (Lincoln Heights):
Max Day + Fire Flow (166.7 L/s): 93.8 m

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

Regards,
Gabrielle (Gabi) Schaeffer, P.Eng
Senior Engineer - Infrastructure Applications

City of Ottawa
Development Review - West Branch
Planning, Real Estate and Economic Development Department

Appendix D Stormwater Management

D.1 Storm Sewer Design Sheet

Stantec	**2475 Regina Street**	**STORM SEWER DESIGN SHEET (City of Ottawa)**	DESIGN PARAMETERS
	DATE: 2025-06-05		$I = a / (t+b)^c$ (As per City of Ottawa Guidelines, 2012)
	REVISION: 5		
	DESIGNED BY: JP	**FILE NUMBER:** **160401689**	
	CHECKED BY: DT		

	1:2 yr	1:5 yr	1:10 yr	1:100 yr					
a =	732.951	998.071	1174.184	1735.688	MANNING'S n =	0.013		BEDDING CLASS =	B
b =	6.199	6.053	6.014	6.014	MINIMUM COVER:	2.00	m		
c =	0.810	0.814	0.816	0.820	TIME OF ENTRY	10	min		

LOCATION / DRAINAGE AREA

AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (2-YEAR) (ha)	AREA (5-YEAR) (ha)	AREA (10-YEAR) (ha)	AREA (100-YEAR) (ha)	AREA (ROOF) (ha)	C (2-YEAR) (-)	C (5-YEAR) (-)	C (10-YEAR) (-)	C (100-YEAR) (-)	A x C (2-YEAR) (ha)	ACCUM AxC (2YR) (ha)	A x C (5-YEAR) (ha)	ACCUM. AxC (5YR) (ha)	A x C (10-YEAR) (ha)	ACCUM. AxC (10YR) (ha)	A x C (100-YEAR) (ha)	ACCUM. AxC (100YR) (ha)	T of C (min)	$I_{2\text{-YEAR}}$ (mm/h)	$I_{5\text{-YEAR}}$ (mm/h)	$I_{10\text{-YEAR}}$ (mm/h)	$I_{100\text{-YEAR}}$ (mm/h)	$Q_{CONTROL}$ (L/s)	ACCUM. $Q_{CONTROL}$ (L/s)	Q_{ACT} (CIA/360) (L/s)
LID-1,LID-3,L103A, ROOF, GRN, CBMH2, DRN2A/B	103	102	0.74	0.00	0.00	0.00	0.00	0.61	0.00	0.00	0.00	0.456	0.456	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	97.2
L102A, RAMP, CB-1, LID2	102	101	0.29	0.00	0.00	0.00	0.00	0.32	0.00	0.00	0.00	0.094	0.549	0.000	0.000	0.000	0.000	0.000	0.000	10.76	74.02	100.37	117.64	171.94	0.0	0.0	113.0
	101	TANK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.549	0.000	0.000	0.000	0.000	0.000	0.000	11.28	72.21	97.87	114.70	167.62	0.0	0.0	110.2
																				11.42							

PIPE SELECTION

AREA ID NUMBER	LENGTH (m)	PIPE WIDTH OR DIAMETE (mm)	PIPE HEIGHT (mm)	PIPE SHAPE (-)	MATERIAL (-)	CLASS (-)	SLOPE %	Q_{CAP} (FULL) (L/s)	% FULL (-)	VEL. (FULL) (m/s)	VEL. (ACT) (m/s)	TIME OF FLOW (min)
LID-1,LID-3,L103A, ROOF, GRN, CBMH2, DRN2A/B	35.3	450	450	CIRCULAR	CONCRETE	-	0.20	133.0	**73.08%**	0.81	0.78	0.76
L102A, RAMP, CB-1, LID2	25.7	450	450	CIRCULAR	CONCRETE	-	0.20	133.0	**84.93%**	0.81	0.81	0.53
	7.1	450	450	CIRCULAR	CONCRETE	-	0.25	148.7	**74.10%**	0.91	0.87	0.14
		450	450									

D.2 PCSWMM Model Input

```
[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option             Value
FLOW_UNITS           LPS
INFILTRATION         HORTON
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         ELEVATION
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           03/07/2024
START_TIME           00:00:00
REPORT_START_DATE    03/07/2024
REPORT_START_TIME    00:00:00
END_DATE             03/08/2024
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:01:00
DRY_STEP             00:01:00
ROUTING_STEP         1
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           8
HEAD_TOLERANCE       0.0015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
```

```
THREADS              8

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
CONSTANT         0.0
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- -------- -------- ----------
RG-C             INTENSITY 0:10     1.0      TIMESERIES 100C
RG-S             INTENSITY 0:15     1.0      TIMESERIES 100S

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack

;;-------------- ---------------- ---------------- -------- -------- -------- -------- --------
----------------
;0.90
CB-1             RG-C             CB1              0.09776  100      121      3        0

;0.80
CBMH2            RG-C             CBMH2-S          0.047    85.71    33       3        0

;0.90
DRN2A            RG-C             103              0.048744 100      41       3        0

;0.69
DRN2B            RG-C             103              0.080316 71.43    27       3        0

;0.30
GRN-1            RG-C             103              0.028    14.29    6.317    3        0

;0.30
GRN-2            RG-C             103              0.065024 14.29    14.63    3        0

;0.30
GRN-3            RG-C             103              0.021139 14.29    4.756    3        0
```

```
;0.76
L102A            RG-C             L102A-S          0.123391 80       51       3        0

;0.90
L103A            RG-C             L103A-S          0.052226 100      40       3        0

;0.26
LID-1            RG-C             LID1A            0.116    8.57     26.1     3        0

;0.50
LID-2            RG-C             LID2             0.06     42.86    39       3        0

;0.30
LID-3            RG-C             LID3-U           0.083    14.29    103      3        0

;0.90
RAMP             RG-C             103              0.009377 100      15       3        0

;0.90
ROOF-1A          RG-C             IRR-TANK         0.031    100      6.975    3        0

;0.90
ROOF-1B          RG-C             ROOF1-S          0.023    100      5.175    3        0

;0.90
ROOF-2A          RG-C             IRR-TANK2        0.039875 100      8.972    3        0

;0.90
ROOF-2B          RG-C             ROOF2B-S         0.012108 100      2.724    3        0

;0.90
ROOF-3A          RG-C             IRR-TANK         0.067    100      15.075   3        0

;0.90
ROOF-3B          RG-C             ROOF3-S          0.031    100      6.975    3        0

[SUBAREAS]
```

```
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
CB-1             0.013      0.25       1.57       4.67       0          OUTLET
CBMH2            0.013      0.25       1.57       4.67       0          OUTLET
DRN2A            0.013      0.25       1.57       4.67       0          OUTLET
DRN2B            0.013      0.25       1.57       4.67       0          OUTLET
GRN-1            0.013      0.25       1.57       4.67       0          OUTLET
GRN-2            0.013      0.25       1.57       4.67       0          OUTLET
GRN-3            0.013      0.25       1.57       4.67       0          OUTLET
L102A            0.013      0.25       1.57       4.67       0          OUTLET
L103A            0.013      0.25       1.57       4.67       0          OUTLET
LID-1            0.013      0.25       1.57       4.67       0          OUTLET
LID-2            0.013      0.25       1.57       4.67       0          OUTLET
LID-3            0.013      0.25       1.57       4.67       0          OUTLET
RAMP             0.013      0.25       1.57       4.67       0          OUTLET
ROOF-1A          0.013      0.25       1.57       4.67       0          OUTLET
ROOF-1B          0.013      0.25       1.57       4.67       0          OUTLET
ROOF-2A          0.013      0.25       1.57       4.67       0          OUTLET
ROOF-2B          0.013      0.25       1.57       4.67       0          OUTLET
ROOF-3A          0.013      0.25       1.57       4.67       0          OUTLET
ROOF-3B          0.013      0.25       1.57       4.67       0          OUTLET

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
CB-1             76.2       13.2       4.14       7          0
CBMH2            76.2       13.2       4.14       7          0
DRN2A            76.2       13.2       4.14       7          0
DRN2B            76.2       13.2       4.14       7          0
GRN-1            76.2       13.2       4.14       7          0
GRN-2            76.2       13.2       4.14       7          0
GRN-3            76.2       13.2       4.14       7          0
L102A            76.2       13.2       4.14       7          0
L103A            76.2       13.2       4.14       7          0
LID-1            76.2       13.2       4.14       7          0
LID-2            76.2       13.2       4.14       7          0
LID-3            76.2       13.2       4.14       7          0
RAMP             76.2       13.2       4.14       7          0
ROOF-1A          76.2       13.2       4.14       7          0
```

```
ROOF-1B          76.2       13.2       4.14       7          0
ROOF-2A          76.2       13.2       4.14       7          0
ROOF-2B          76.2       13.2       4.14       7          0
ROOF-3A          76.2       13.2       4.14       7          0
ROOF-3B          76.2       13.2       4.14       7          0

[LID_CONTROLS]
;;Name           Type/Layer Parameters
;;-------------- ---------- ----------
GREEN-ROOF       GR
GREEN-ROOF       SURFACE    150        0.3        0.035      1.5        5
GREEN-ROOF       SOIL       200        0.46       0.23       0.12       3.3        10.0       3.5
GREEN-ROOF       DRAINMAT   5          0.5        0.1

[LID_USAGE]
;;Subcatchment   LID Process      Number  Area       Width      InitSat    FromImp    ToPerv     RptFile
              DrainTo          FromPerv
;;-------------- ---------------- ------- ---------- ---------- ---------- ---------- ----------
------------------------ ---------------- ----------

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
EX-STRM          63.05      FREE                        NO
OF-LID1          62.25      FREE                        NO
OF-LID2          63.33      FREE                        NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params            SurDepth Fevap
Psi      Ksat     IMD
;;-------------- -------- ---------- ---------- ---------- ---------------------------- -------- --------
-------- -------- --------
100              63.43    1.761      0          FUNCTIONAL  0         0         1.13     0        0
101              63.67    1.57       0          FUNCTIONAL  0         0         1.13     0        0
102              63.79    1.47       0          FUNCTIONAL  0         0         1.13     0        0
103              63.91    1.32       0          FUNCTIONAL  0         0         1.13     0        0
CB1              63.72    1.78       0          TABULAR     CB1-V                       0        0
CBMH2-S          61.15    3.84       0          TABULAR     SUBDRAIN                    0        0
IRR-TANK         80       1.3        0          FUNCTIONAL  0         0         60       0        0
IRR-TANK2        80       1.3        0          FUNCTIONAL  0         0         30       0        0
L102A-S          63.95    1.41       0          TABULAR     L102A-V                     0        0
L103A-S          64.03    1.3        0          TABULAR     L103A-V                     0        0
LID1A            63.09    0.45       0          TABULAR     LID1A-V                     0        0
LID1B            62.58    0.46       0          TABULAR     LID1B-V                     0        0
LID1C            62       0.45       0          TABULAR     LID1C-V                     0        0
LID2             64.85    0.5        0          TABULAR     LID2-V                      0        0
LID3             63.1     0.8        0          TABULAR     LID3-V                      0        0
LID3-U           65.22    0.13       0          FUNCTIONAL  0         0         0        0        0
ROOF1-S          100      0.15       0          TABULAR     ROOF1-V                     0        0
ROOF2B-S         100      0.15       0          TABULAR     ROOF2B-V                    0        0
ROOF3-S          100      0.15       0          TABULAR     ROOF3-V                     0        0
TANK             62.5     2.5        1          TABULAR     TANK-V                      0        0

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset   OutOffset  InitFlow
MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ----------
----------
100--EX          100              EX-STRM          63.9       0.013      63.43      63.05      0          0

101-TANK         101              TANK             7.1        0.013      63.67      63.65      0          0

102-101          102              101              25.7       0.013      63.79      63.74      0          0

103-102          103              102              35.3       0.013      63.91      63.84      0          0

LID2-U--LID2     LID3-U           LID3             55.3       0.035      65.22      63.7       0          0


[PUMPS]
;;Name           From Node        To Node          Pump Curve       Status   Startup  Shutoff
;;-------------- ---------------- ---------------- ---------------- -------- -------- --------
CBMH2-P          CBMH2-S          103              CBMH2-Q          ON       0        0
OR1              CB1              103              1                ON       0        0

[ORIFICES]
;;Name           From Node        To Node          Type         Offset     Qcoeff     Gated    CloseTime
;;-------------- ---------------- ---------------- ------------ ---------- ---------- -------- ----------
```

```
IRR-TANK2-O      IRR-TANK2        103              SIDE         81         0.61       NO       0
IRR-TANK-O       IRR-TANK         103              SIDE         81         0.61       NO       0
L102A-O          L102A-S          102              SIDE         63.95      0.572      NO       0
L103A-O          L103A-S          102              SIDE         64.03      0.572      NO       0
TANK--100        TANK             100              SIDE         63.5       0.61       NO       0

[WEIRS]
;;Name           From Node        To Node          Type         CrestHt    Qcoeff     Gated    EndCon
EndCoeff   Surcharge  RoadWidth  RoadSurf   Coeff. Curve
;;-------------- ---------------- ---------------- ------------ ---------- ---------- -------- --------
---------- ---------- ---------- ---------- ----------------
MJ-LID1B         LID1A            LID1B            TRANSVERSE   63.44      1.67       NO       0        0
       YES
MJ-LID1C         LID1B            LID1C            TRANSVERSE   62.94      1.67       NO       0        0
       YES
MJ-OF-LID1       LID1C            OF-LID1          TRANSVERSE   62.35      1.67       NO       0        0
       YES
MJ-OF-LID2       LID3             OF-LID2          TRANSVERSE   63.8       1.67       NO       0        0
       YES
W2               TANK             100              TRANSVERSE   64         1.67       NO       0        0
       YES
W3               CB1              103              TRANSVERSE   65.35      1.67       NO       0        0
       YES

[OUTLETS]
;;Name           From Node        To Node          Offset     Type             QTable/Qcoeff    Qexpon
Gated
;;-------------- ---------------- ---------------- ---------- ---------------- ---------------- ----------
--------
LID3A-O          LID2             103              65.05      TABULAR/HEAD     S30_GRATE
YES
LID3-O           LID3             CBMH2-S          63.45      TABULAR/HEAD     S30_GRATE
NO
OR2              LID1C            CBMH2-S          62.15      TABULAR/HEAD     S30_GRATE
NO
ROOF1-O          ROOF1-S          IRR-TANK         100        TABULAR/HEAD     ROOF1-Q
NO
ROOF2B-O         ROOF2B-S         IRR-TANK2        100        TABULAR/HEAD     ROOF2B-Q
NO
```

```
ROOF3-O          ROOF3-S          IRR-TANK         100        TABULAR/HEAD     ROOF3-Q
NO

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ---------- ---------- ----------
100--EX          CIRCULAR     0.3              0          0          0          1
101-TANK         CIRCULAR     0.45             0          0          0          1
102-101          CIRCULAR     0.45             0          0          0          1
103-102          CIRCULAR     0.45             0          0          0          1
LID2-U--LID2     TRIANGULAR   0.2              2          0          0          1
IRR-TANK2-O      CIRCULAR     0.3              0          0          0
IRR-TANK-O       CIRCULAR     0.3              0          0          0
L102A-O          CIRCULAR     0.108            0          0          0
L103A-O          CIRCULAR     0.083            0          0          0
TANK--100        CIRCULAR     0.3              0          0          0
MJ-LID1B         RECT_OPEN    0.1              1          0          0
MJ-LID1C         RECT_OPEN    0.1              1          0          0
MJ-OF-LID1       RECT_OPEN    0.1              3          0          0
MJ-OF-LID2       RECT_OPEN    0.1              1          0          0
W2               RECT_OPEN    0.9              1.2        0          0
W3               RECT_OPEN    0.1              6          0          0

[LOSSES]
;;Link           Kentry     Kexit      Kavg       Flap Gate  Seepage
;;-------------- ---------- ---------- ---------- ---------- ----------
102-101          0          1.344      0          NO         0
103-102          0          1.344      0          NO         0

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
1                Pump4      0          0
1                           1.38       21.2
1                           1.73       23.7
1                           1.78       24.1

CBMH2-Q          Pump4      0          0
CBMH2-Q                     0.3        4
```

CBMH2-Q		3.84	4
ROOF1-Q	Rating	0	0
ROOF1-Q		0.025	0.9464
ROOF1-Q		0.05	1.8927
ROOF1-Q		0.075	1.8927
ROOF1-Q		0.1	1.8927
ROOF1-Q		0.125	1.8927
ROOF1-Q		0.15	1.8927
ROOF2A-Q	Rating	0	0
ROOF2A-Q		0.025	1.5773
ROOF2A-Q		0.05	3.1545
ROOF2A-Q		0.075	3.1545
ROOF2A-Q		0.1	3.1545
ROOF2A-Q		0.125	3.1545
ROOF2A-Q		0.15	3.1545
ROOF2B-Q	Rating	0	0
ROOF2B-Q		0.025	0.9464
ROOF2B-Q		0.05	1.8927
ROOF2B-Q		0.075	1.8927
ROOF2B-Q		0.1	1.8927
ROOF2B-Q		0.125	1.8927
ROOF2B-Q		0.15	1.8927
ROOF3-Q	Rating	0	0
ROOF3-Q		0.025	0.9464
ROOF3-Q		0.05	1.8927
ROOF3-Q		0.075	2.1293
ROOF3-Q		0.1	2.3659
ROOF3-Q		0.125	2.6025
ROOF3-Q		0.15	2.8391
S30_GRATE	Rating	0	0
S30_GRATE		0.01	7.3
S30_GRATE		0.02	10.3
S30_GRATE		0.03	12.6
S30_GRATE		0.04	14.5
S30_GRATE		0.05	16.2
S30_GRATE		0.06	17.8
S30_GRATE		0.07	19.2
S30_GRATE		0.08	20.5
S30_GRATE		0.09	21.8
S30_GRATE		0.1	22.9
S30_GRATE		0.11	24.1
S30_GRATE		0.12	25.1
S30_GRATE		0.13	26.2
S30_GRATE		0.14	27.1
S30_GRATE		0.15	28.1
S30_GRATE		0.16	29
S30_GRATE		0.17	29.9
S30_GRATE		0.18	30.8
S30_GRATE		0.19	31.6
S30_GRATE		0.2	32.4
S30_GRATE		0.21	33.2
S30_GRATE		0.22	34
S30_GRATE		0.23	34.8
S30_GRATE		0.24	35.5
S30_GRATE		0.25	36.3
S30_GRATE		0.26	37
S30_GRATE		0.27	37.7
S30_GRATE		0.28	38.4
S30_GRATE		0.29	39.1
S30_GRATE		0.3	39.7
S30_GRATE		0.31	40.4
S30_GRATE		0.32	41
S30_GRATE		0.33	41.7
S30_GRATE		0.34	42.3
S30_GRATE		0.35	42.9
S30_GRATE		0.36	43.5
S30_GRATE		0.37	44.1
S30_GRATE		0.38	44.7
S30_GRATE		0.39	45.3
S30_GRATE		0.4	45.9
S30_GRATE		0.41	46.5
S30_GRATE		0.42	47
S30_GRATE		0.43	47.6

S30_GRATE		0.44	48.1
S30_GRATE		0.45	48.7
S30_GRATE		0.46	49.2
S30_GRATE		0.47	49.7
S30_GRATE		0.48	50.3
S30_GRATE		0.49	50.8
S30_GRATE		0.5	51.3
CB1-V	Storage	0	0.36
CB1-V		1.38	0.36
CB1-V		1.58	220.1
CB1-V		1.78	220.1
CC1-V	Storage	0	0
CC1-V		0.35	164
L102A-V	Storage	0	0.36
L102A-V		1	0.36
L102A-V		1.31	466.5
L103A-V	Storage	0	0.36
L103A-V		1	0.36
L103A-V		1.2	175
LID1A-V	Storage	0	14
LID1A-V		0.35	43
LID1B-V	Storage	0	14
LID1B-V		0.36	41
LID1C-V	Storage	0	8
LID1C-V		0.35	96.1
LID2-V	Storage	0	19
LID2-V		0.41	66.8
LID3-V	Storage	0	11
LID3-V		0.7	78

ROOF1-V	Storage	0	0
ROOF1-V		0.025	5
ROOF1-V		0.05	20
ROOF1-V		0.075	46
ROOF1-V		0.1	82
ROOF1-V		0.125	128
ROOF1-V		0.15	184
ROOF2A-V	Storage	0	0
ROOF2A-V		0.025	9
ROOF2A-V		0.05	35
ROOF2A-V		0.075	80
ROOF2A-V		0.1	142
ROOF2A-V		0.125	222
ROOF2A-V		0.15	319
ROOF2B-V	Storage	0	0
ROOF2B-V		0.025	3
ROOF2B-V		0.05	11
ROOF2B-V		0.075	24
ROOF2B-V		0.1	43
ROOF2B-V		0.125	67
ROOF2B-V		0.15	97
ROOF3-V	Storage	0	0
ROOF3-V		0.025	7
ROOF3-V		0.05	28
ROOF3-V		0.075	62
ROOF3-V		0.1	110
ROOF3-V		0.125	172
ROOF3-V		0.15	248
SUBDRAIN	Storage	0	26.5
SUBDRAIN		1	26.5
TANK-V	Storage	0	150
TANK-V		0.875	149.99
TANK-V		0.901	150
TANK-V		0.926	149.99

```
TANK-V                      0.952      150
TANK-V                      0.977      149.99
TANK-V                      1.002      306.66
TANK-V                      1.028      306.66
TANK-V                      1.053      306.66
TANK-V                      1.079      306.66
TANK-V                      1.104      293.33
TANK-V                      1.129      293.33
TANK-V                      1.155      280
TANK-V                      1.18       280
TANK-V                      1.206      266.66
TANK-V                      1.231      266.66
TANK-V                      1.256      240
TANK-V                      1.282      240
TANK-V                      1.307      213.33
TANK-V                      1.333      213.33
TANK-V                      1.358      173.33
TANK-V                      1.383      160
TANK-V                      1.409      146.67
TANK-V                      1.434      146.67
TANK-V                      1.46       150
TANK-V                      1.485      150
TANK-V                      1.51       150
TANK-V                      1.536      150
TANK-V                      1.561      150
TANK-V                      1.56101    0

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
002C                        0:00       0
002C                        0:10       2.81
002C                        0:20       3.5
002C                        0:30       4.69
002C                        0:40       7.3
002C                        0:50       18.21
002C                        1:00       76.81
002C                        1:10       24.08
002C                        1:20       12.36
002C                        1:30       8.32
002C                        1:40       6.3
002C                        1:50       5.09
002C                        2:00       4.29
002C                        2:10       3.72
002C                        2:20       3.29
002C                        2:30       2.95
002C                        2:40       2.68
002C                        2:50       2.46
002C                        3:00       2.28

002S                        0:00       1.06
002S                        0:15       1.06
002S                        0:30       1.06
002S                        0:45       1.06
002S                        1:00       1.06
002S                        1:15       1.06
002S                        1:30       1.06
002S                        1:45       1.06
002S                        2:00       1.27
002S                        2:15       1.27
002S                        2:30       1.27
002S                        2:45       1.27
002S                        3:00       1.69
002S                        3:15       1.69
002S                        3:30       1.69
002S                        3:45       1.69
002S                        4:00       2.54
002S                        4:15       2.54
002S                        4:30       3.39
002S                        4:45       3.39
002S                        5:00       5.08
002S                        5:15       5.08
002S                        5:30       20.33
002S                        5:45       55.90
002S                        6:00       7.62
002S                        6:15       7.62
002S                        6:30       3.39
002S                        6:45       3.39
```

002S	7:00	2.54
002S	7:15	2.54
002S	7:30	2.54
002S	7:45	2.54
002S	8:00	1.48
002S	8:15	1.48
002S	8:30	1.48
002S	8:45	1.48
002S	9:00	1.48
002S	9:15	1.48
002S	9:30	1.48
002S	9:45	1.48
002S	10:00	0.85
002S	10:15	0.85
002S	10:30	0.85
002S	10:45	0.85
002S	11:00	0.85
002S	11:15	0.85
002S	11:30	0.85
002S	11:45	0.85
002S	12:00	0

005C	0:00	0
005C	0:10	3.68
005C	0:20	4.58
005C	0:30	6.15
005C	0:40	9.61
005C	0:50	24.17
005C	1:00	104.19
005C	1:10	32.04
005C	1:20	16.34
005C	1:30	10.96
005C	1:40	8.29
005C	1:50	6.69
005C	2:00	5.63
005C	2:10	4.87
005C	2:20	4.3
005C	2:30	3.86
005C	2:40	3.51
005C	2:50	3.22
005C	3:00	2.98

005S	0:00	1.40
005S	0:15	1.40
005S	0:30	1.40
005S	0:45	1.40
005S	1:00	1.40
005S	1:15	1.40
005S	1:30	1.40
005S	1:45	1.40
005S	2:00	1.69
005S	2:15	1.69
005S	2:30	1.69
005S	2:45	1.69
005S	3:00	2.25
005S	3:15	2.25
005S	3:30	2.25
005S	3:45	2.25
005S	4:00	3.37
005S	4:15	3.37
005S	4:30	4.49
005S	4:45	4.49
005S	5:00	6.74
005S	5:15	6.74
005S	5:30	26.96
005S	5:45	74.15
005S	6:00	10.11
005S	6:15	10.11
005S	6:30	4.49
005S	6:45	4.49
005S	7:00	3.37
005S	7:15	3.37
005S	7:30	3.37
005S	7:45	3.37
005S	8:00	1.97
005S	8:15	1.97
005S	8:30	1.97
005S	8:45	1.97

005S	9:00	1.97
005S	9:15	1.97
005S	9:30	1.97
005S	9:45	1.97
005S	10:00	1.12
005S	10:15	1.12
005S	10:30	1.12
005S	10:45	1.12
005S	11:00	1.12
005S	11:15	1.12
005S	11:30	1.12
005S	11:45	1.12
005S	12:00	0
100C	0:00	0
100C	0:10	6.05
100C	0:20	7.54
100C	0:30	10.16
100C	0:40	15.97
100C	0:50	40.65
100C	1:00	178.56
100C	1:10	54.05
100C	1:20	27.32
100C	1:30	18.24
100C	1:40	13.74
100C	1:50	11.06
100C	2:00	9.29
100C	2:10	8.02
100C	2:20	7.08
100C	2:30	6.35
100C	2:40	5.76
100C	2:50	5.28
100C	3:00	4.88
100S	0:00	2.35
100S	0:15	2.35
100S	0:30	2.35
100S	0:45	2.35
100S	1:00	2.35

100S	1:15	2.35
100S	1:30	2.35
100S	1:45	2.35
100S	2:00	2.82
100S	2:15	2.82
100S	2:30	2.82
100S	2:45	2.82
100S	3:00	3.76
100S	3:15	3.76
100S	3:30	3.76
100S	3:45	3.76
100S	4:00	5.63
100S	4:15	5.63
100S	4:30	7.51
100S	4:45	7.51
100S	5:00	11.27
100S	5:15	11.27
100S	5:30	45.07
100S	5:45	123.95
100S	6:00	16.90
100S	6:15	16.90
100S	6:30	7.51
100S	6:45	7.51
100S	7:00	5.63
100S	7:15	5.63
100S	7:30	5.63
100S	7:45	5.63
100S	8:00	3.29
100S	8:15	3.29
100S	8:30	3.29
100S	8:45	3.29
100S	9:00	3.29
100S	9:15	3.29
100S	9:30	3.29
100S	9:45	3.29
100S	10:00	1.88
100S	10:15	1.88
100S	10:30	1.88
100S	10:45	1.88

100S	11:00	1.88
100S	11:15	1.88
100S	11:30	1.88
100S	11:45	1.88
100S	12:00	0
120C	0:00	0
120C	0:10	7.26
120C	0:20	9.048
120C	0:30	12.192
120C	0:40	19.164
120C	0:50	48.78
120C	1:00	214.272
120C	1:10	64.86
120C	1:20	32.784
120C	1:30	21.888
120C	1:40	16.488
120C	1:50	13.272
120C	2:00	11.148
120C	2:10	9.624
120C	2:20	8.496
120C	2:30	7.62
120C	2:40	6.912
120C	2:50	6.336
120C	3:00	5.856
120S	0:00	2.82
120S	0:15	2.82
120S	0:30	2.82
120S	0:45	2.82
120S	1:00	2.82
120S	1:15	2.82
120S	1:30	2.82
120S	1:45	2.82
120S	2:00	3.38
120S	2:15	3.38
120S	2:30	3.38
120S	2:45	3.38
120S	3:00	4.51

120S	3:15	4.51
120S	3:30	4.51
120S	3:45	4.51
120S	4:00	6.76
120S	4:15	6.76
120S	4:30	9.01
120S	4:45	9.01
120S	5:00	13.52
120S	5:15	13.52
120S	5:30	54.09
120S	5:45	148.74
120S	6:00	20.28
120S	6:15	20.28
120S	6:30	9.01
120S	6:45	9.01
120S	7:00	6.76
120S	7:15	6.76
120S	7:30	6.76
120S	7:45	6.76
120S	8:00	3.94
120S	8:15	3.94
120S	8:30	3.94
120S	8:45	3.94
120S	9:00	3.94
120S	9:15	3.94
120S	9:30	3.94
120S	9:45	3.94
120S	10:00	2.25
120S	10:15	2.25
120S	10:30	2.25
120S	10:45	2.25
120S	11:00	2.25
120S	11:15	2.25
120S	11:30	2.25
120S	11:45	2.25
120S	12:00	0
25.0mm	0:10	1.516088055
25.0mm	0:20	1.749115351

```
25.0mm                    0:30       2.078715445
25.0mm                    0:40       2.583625152
25.0mm                    0:50       3.461716789
25.0mm                    1:00       5.394996968
25.0mm                    1:10       13.44811663
25.0mm                    1:20       56.72433275
25.0mm                    1:30       17.78358976
25.0mm                    1:40       9.131254948
25.0mm                    1:50       6.147712357
25.0mm                    2:00       4.655383456
25.0mm                    2:10       3.762897479
25.0mm                    2:20       3.169361772
25.0mm                    2:30       2.745825503
25.0mm                    2:40       2.428071751
25.0mm                    2:50       2.180598417
25.0mm                    3:00       1.982179574
25.0mm                    3:10       1.819403154
25.0mm                    3:20       1.683310546
25.0mm                    3:30       1.567742242
25.0mm                    3:40       1.468311255
25.0mm                    3:50       1.381797508
25.0mm                    4:00       1.305793328

39.2mm                    0:10       2.374535876
39.2mm                    0:20       2.739509186
39.2mm                    0:30       3.255737280
39.2mm                    0:40       4.046539773
39.2mm                    0:50       5.421829347
39.2mm                    1:00       8.449782195
39.2mm                    1:10       21.06278412
39.2mm                    1:20       88.84310033
39.2mm                    1:30       27.85311299
39.2mm                    1:40       14.30160498
39.2mm                    1:50       9.628704284
39.2mm                    2:00       7.291380602
39.2mm                    2:10       5.893546245
39.2mm                    2:20       4.963935444
39.2mm                    2:30       4.300582110
39.2mm                    2:40       3.802908059
39.2mm                    2:50       3.415308996
39.2mm                    3:00       3.104540331
39.2mm                    3:10       2.849595740
39.2mm                    3:20       2.636444017
39.2mm                    3:30       2.455437985
39.2mm                    3:40       2.299706631
39.2mm                    3:50       2.164206588
39.2mm                    4:00       2.045166898

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS       360703.57265     5025681.36685    360885.96035     5025849.29615
UNITS            Meters

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
EX-STRM          360728.2           5025689
OF-LID1          360712.971         5025788.325
OF-LID2          360803.756         5025841.663
100              360775.8           5025731.7
101              360781.3           5025747.1
102              360759.6           5025766.5
103              360780.1           5025789.7
CB1              360811.792         5025749.2
CBMH2-S          360782.3           5025812.8
IRR-TANK         360788.68          5025792.557
IRR-TANK2        360775.727         5025793.437
L102A-S          360766.818         5025755.412
L103A-S          360758.953         5025775.733
```

```
LID1A            360736.725         5025763.507
LID1B            360727.862         5025772.37
LID1C            360718.289         5025783.184
LID2             360862.348         5025782.86
LID3             360810.525         5025835.74
LID3-U           360856.836         5025795.863
ROOF1-S          360790.43          5025765.938
ROOF2B-S         360764.201         5025795.763
ROOF3-S          360829.338         5025798.005
TANK             360775.8           5025741.2

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
CBMH2-P          360789.58          5025797.752
W2               360771.874         5025738.377
W3               360798.255         5025774.754
LID3A-O          360821.224         5025786.28
LID3-O           360783.002         5025819.904
OR2              360772.714         5025815.35

[POLYGONS]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
CB-1             360847.892         5025767.8
CB-1             360850.504         5025764.573
CB-1             360850.504         5025764.573
CB-1             360790.952         5025726.18
CB-1             360790.952         5025726.18
CB-1             360786.342         5025735.572
CB-1             360786.342         5025735.572
CB-1             360789.33          5025737.6
CB-1             360789.33          5025737.6
CB-1             360789.449         5025737.488
CB-1             360792.965         5025739.985
CB-1             360795.054         5025742.066
CB-1             360795.054         5025742.066
CB-1             360800.4           5025748.113
CB-1             360800.4           5025748.113
```

```
CB-1             360802.024         5025746.683
CB-1             360802.024         5025746.683
CB-1             360806.254         5025751.484
CB-1             360806.254         5025751.484
CB-1             360807.657         5025750.246
CB-1             360807.657         5025750.246
CB-1             360811.065         5025754.118
CB-1             360811.065         5025754.118
CB-1             360812.26          5025755.475
CB-1             360812.26          5025755.475
CB-1             360813.092         5025754.731
CB-1             360813.092         5025754.731
CB-1             360817.823         5025760.09
CB-1             360817.823         5025760.09
CB-1             360819.48          5025764.702
CB-1             360819.48          5025764.702
CB-1             360820.671         5025766.049
CB-1             360820.671         5025766.049
CB-1             360824.84          5025770.642
CB-1             360824.84          5025770.642
CB-1             360828.245         5025771.751
CB-1             360828.245         5025771.751
CB-1             360831.063         5025771.931
CB-1             360831.063         5025771.931
CB-1             360837.174         5025778.859
CB-1             360837.174         5025778.859
CB-1             360838.651         5025779.382
CB-1             360838.651         5025779.382
CB-1             360838.662         5025779.386
CB-1             360838.662         5025779.386
CB-1             360839.966         5025774.929
CB-1             360839.966         5025774.929
CB-1             360844.832         5025770.628
CB-1             360844.832         5025770.628
CB-1             360847.892         5025767.8
CBMH2            360785.068         5025797.51
CBMH2            360774.783         5025815.591
CBMH2            360774.783         5025815.591
CBMH2            360777.539         5025817.25
```

CBMH2	360777.539	5025817.25
CBMH2	360775.087	5025819.359
CBMH2	360775.087	5025819.359
CBMH2	360777.754	5025820.87
CBMH2	360777.754	5025820.87
CBMH2	360787.054	5025813.346
CBMH2	360787.054	5025813.346
CBMH2	360791.761	5025818.852
CBMH2	360791.761	5025818.852
CBMH2	360802.562	5025809.399
CBMH2	360802.562	5025809.399
CBMH2	360803.557	5025810.524
CBMH2	360803.557	5025810.524
CBMH2	360808.292	5025806.352
CBMH2	360808.292	5025806.352
CBMH2	360799.694	5025796.787
CBMH2	360799.694	5025796.787
CBMH2	360797.485	5025794.449
CBMH2	360788.027	5025796.109
CBMH2	360785.068	5025797.51
DRN2A	360780.116	5025781.568
DRN2A	360774.542	5025791.367
DRN2A	360774.542	5025791.367
DRN2A	360780.052	5025794.501
DRN2A	360780.052	5025794.501
DRN2A	360785.068	5025797.51
DRN2A	360785.068	5025797.51
DRN2A	360788.027	5025796.109
DRN2A	360797.485	5025794.449
DRN2A	360799.694	5025796.787
DRN2A	360799.694	5025796.787
DRN2A	360808.292	5025806.352
DRN2A	360808.292	5025806.352
DRN2A	360809.194	5025805.553
DRN2A	360809.194	5025805.553
DRN2A	360809.188	5025805.546
DRN2A	360809.188	5025805.546
DRN2A	360809.194	5025805.553
DRN2A	360809.194	5025805.553

DRN2A	360815.454	5025800.01
DRN2A	360815.454	5025800.01
DRN2A	360800.892	5025783.531
DRN2A	360800.892	5025783.531
DRN2A	360799.665	5025782.213
DRN2A	360799.665	5025782.213
DRN2A	360796.609	5025778.77
DRN2A	360796.609	5025778.77
DRN2A	360788.172	5025786.199
DRN2A	360788.172	5025786.199
DRN2A	360782.361	5025779.593
DRN2A	360782.361	5025779.593
DRN2A	360780.116	5025781.568
DRN2B	360815.454	5025800.01
DRN2B	360838.651	5025779.382
DRN2B	360838.651	5025779.382
DRN2B	360837.174	5025778.859
DRN2B	360837.174	5025778.859
DRN2B	360831.063	5025771.931
DRN2B	360831.063	5025771.931
DRN2B	360828.245	5025771.751
DRN2B	360828.245	5025771.751
DRN2B	360824.84	5025770.642
DRN2B	360824.84	5025770.642
DRN2B	360820.671	5025766.049
DRN2B	360820.671	5025766.049
DRN2B	360819.48	5025764.702
DRN2B	360819.48	5025764.702
DRN2B	360817.823	5025760.09
DRN2B	360817.823	5025760.09
DRN2B	360796.609	5025778.77
DRN2B	360796.609	5025778.77
DRN2B	360799.665	5025782.213
DRN2B	360799.665	5025782.213
DRN2B	360800.892	5025783.531
DRN2B	360800.892	5025783.531
DRN2B	360815.454	5025800.01
GRN-1	360782.361	5025779.593
GRN-1	360788.172	5025786.199

GRN-1	360788.172	5025786.199
GRN-1	360796.609	5025778.77
GRN-1	360796.609	5025778.77
GRN-1	360796.584	5025778.742
GRN-1	360796.584	5025778.742
GRN-1	360796.609	5025778.77
GRN-1	360796.609	5025778.77
GRN-1	360817.823	5025760.09
GRN-1	360817.823	5025760.09
GRN-1	360813.092	5025754.731
GRN-1	360813.092	5025754.731
GRN-1	360812.26	5025755.475
GRN-1	360812.26	5025755.475
GRN-1	360811.065	5025754.118
GRN-1	360811.065	5025754.118
GRN-1	360805.776	5025758.774
GRN-1	360805.776	5025758.774
GRN-1	360807.538	5025760.763
GRN-1	360807.538	5025760.763
GRN-1	360787.661	5025778.266
GRN-1	360787.661	5025778.266
GRN-1	360785.9	5025776.269
GRN-1	360785.9	5025776.269
GRN-1	360782.361	5025779.593
GRN-2	360780.052	5025794.501
GRN-2	360744.668	5025774.373
GRN-2	360744.668	5025774.373
GRN-2	360735.577	5025790.359
GRN-2	360735.577	5025790.359
GRN-2	360735.047	5025790.057
GRN-2	360735.047	5025790.057
GRN-2	360734.775	5025790.536
GRN-2	360734.775	5025790.536
GRN-2	360770.687	5025810.963
GRN-2	360770.687	5025810.963
GRN-2	360780.052	5025794.501
GRN-3	360815.454	5025800.01
GRN-3	360809.194	5025805.553
GRN-3	360809.194	5025805.553
GRN-3	360815.314	5025812.494
GRN-3	360815.314	5025812.494
GRN-3	360820.358	5025808.04
GRN-3	360820.358	5025808.04
GRN-3	360816.846	5025803.969
GRN-3	360816.846	5025803.969
GRN-3	360839.136	5025784.38
GRN-3	360839.136	5025784.38
GRN-3	360843.282	5025789.082
GRN-3	360843.282	5025789.082
GRN-3	360845.559	5025787.075
GRN-3	360845.559	5025787.075
GRN-3	360838.651	5025779.382
GRN-3	360838.651	5025779.382
GRN-3	360815.454	5025800.01
L102A	360772.398	5025772.821
L102A	360795.556	5025752.387
L102A	360795.556	5025752.387
L102A	360793.302	5025749.798
L102A	360793.302	5025749.798
L102A	360787.47	5025743.961
L102A	360787.47	5025743.961
L102A	360786.245	5025742.972
L102A	360786.245	5025742.972
L102A	360789.33	5025737.6
L102A	360789.33	5025737.6
L102A	360786.342	5025735.572
L102A	360786.342	5025735.572
L102A	360790.952	5025726.18
L102A	360790.952	5025726.18
L102A	360774.766	5025715.471
L102A	360774.766	5025715.471
L102A	360763.936	5025727.179
L102A	360763.936	5025727.179
L102A	360768.837	5025731.822
L102A	360768.837	5025731.822
L102A	360769.26	5025734.51
L102A	360769.26	5025734.51
L102A	360768.863	5025738.047

L102A	360768.863	5025738.047
L102A	360754.399	5025763.505
L102A	360754.399	5025763.505
L102A	360772.398	5025772.821
L103A	360740.15	5025771.959
L103A	360744.668	5025774.373
L103A	360744.668	5025774.373
L103A	360774.542	5025791.367
L103A	360774.542	5025791.367
L103A	360780.116	5025781.568
L103A	360780.116	5025781.568
L103A	360772.398	5025772.821
L103A	360772.398	5025772.821
L103A	360754.399	5025763.505
L103A	360754.399	5025763.505
L103A	360754.349	5025763.593
L103A	360754.349	5025763.593
L103A	360751.234	5025766.014
L103A	360751.234	5025766.014
L103A	360746.139	5025765.543
L103A	360746.139	5025765.543
L103A	360745.222	5025765.204
L103A	360745.222	5025765.204
L103A	360744.211	5025765.349
L103A	360744.211	5025765.349
L103A	360743.255	5025766.095
L103A	360743.255	5025766.095
L103A	360740.15	5025771.959
LID-1	360711.863	5025783.54
LID-1	360775.087	5025819.359
LID-1	360775.087	5025819.359
LID-1	360777.539	5025817.25
LID-1	360777.539	5025817.25
LID-1	360774.783	5025815.591
LID-1	360774.783	5025815.591
LID-1	360726.152	5025787.928
LID-1	360726.152	5025787.928
LID-1	360736.437	5025769.847
LID-1	360736.437	5025769.847
LID-1	360740.15	5025771.959
LID-1	360740.15	5025771.959
LID-1	360743.255	5025766.095
LID-1	360743.255	5025766.095
LID-1	360744.211	5025765.349
LID-1	360744.211	5025765.349
LID-1	360745.222	5025765.204
LID-1	360745.222	5025765.204
LID-1	360746.139	5025765.543
LID-1	360746.139	5025765.543
LID-1	360751.234	5025766.014
LID-1	360751.234	5025766.014
LID-1	360754.349	5025763.593
LID-1	360754.349	5025763.593
LID-1	360754.399	5025763.505
LID-1	360754.399	5025763.505
LID-1	360754.214	5025763.409
LID-1	360754.214	5025763.409
LID-1	360754.399	5025763.505
LID-1	360754.399	5025763.505
LID-1	360768.863	5025738.047
LID-1	360768.863	5025738.047
LID-1	360769.26	5025734.51
LID-1	360769.26	5025734.51
LID-1	360768.837	5025731.822
LID-1	360768.837	5025731.822
LID-1	360763.936	5025727.179
LID-1	360763.936	5025727.179
LID-1	360711.863	5025783.54
LID-2	360854.46	5025792.634
LID-2	360863.387	5025794.677
LID-2	360863.387	5025794.677
LID-2	360877.67	5025782.093
LID-2	360877.67	5025782.093
LID-2	360850.504	5025764.573
LID-2	360850.504	5025764.573
LID-2	360847.892	5025767.8
LID-2	360847.892	5025767.8
LID-2	360844.832	5025770.628

LID-2	360844.832	5025770.628
LID-2	360839.966	5025774.929
LID-2	360839.966	5025774.929
LID-2	360838.662	5025779.386
LID-2	360838.662	5025779.386
LID-2	360838.651	5025779.382
LID-2	360838.651	5025779.382
LID-2	360845.559	5025787.075
LID-2	360845.559	5025787.075
LID-2	360845.563	5025787.071
LID-2	360845.563	5025787.071
LID-2	360845.559	5025787.075
LID-2	360845.559	5025787.075
LID-2	360845.932	5025787.49
LID-2	360845.932	5025787.49
LID-2	360848.203	5025785.541
LID-2	360848.203	5025785.541
LID-2	360854.46	5025792.634
LID-3	360854.46	5025792.634
LID-3	360810.226	5025831.443
LID-3	360810.226	5025831.443
LID-3	360803.082	5025823.267
LID-3	360803.082	5025823.267
LID-3	360800.822	5025825.284
LID-3	360800.822	5025825.284
LID-3	360794.621	5025818.2
LID-3	360794.621	5025818.2
LID-3	360803.557	5025810.524
LID-3	360803.557	5025810.524
LID-3	360802.562	5025809.399
LID-3	360802.562	5025809.399
LID-3	360791.761	5025818.852
LID-3	360791.761	5025818.852
LID-3	360787.054	5025813.346
LID-3	360787.054	5025813.346
LID-3	360777.754	5025820.87
LID-3	360777.754	5025820.87
LID-3	360811.824	5025840.172
LID-3	360811.824	5025840.172

LID-3	360863.387	5025794.677
LID-3	360863.387	5025794.677
LID-3	360854.46	5025792.634
RAMP	360795.556	5025752.387
RAMP	360800.4	5025748.113
RAMP	360800.4	5025748.113
RAMP	360795.054	5025742.066
RAMP	360795.054	5025742.066
RAMP	360792.965	5025739.985
RAMP	360789.449	5025737.488
RAMP	360789.33	5025737.6
RAMP	360789.33	5025737.6
RAMP	360786.245	5025742.972
RAMP	360786.245	5025742.972
RAMP	360787.47	5025743.961
RAMP	360787.47	5025743.961
RAMP	360793.302	5025749.798
RAMP	360793.302	5025749.798
RAMP	360795.556	5025752.387
ROOF-1A	360806.147	5025758.447
ROOF-1A	360811.065	5025754.118
ROOF-1A	360807.657	5025750.246
ROOF-1A	360806.254	5025751.484
ROOF-1A	360802.024	5025746.683
ROOF-1A	360800.4	5025748.113
ROOF-1A	360795.556	5025752.387
ROOF-1A	360772.398	5025772.821
ROOF-1A	360780.116	5025781.568
ROOF-1A	360782.361	5025779.593
ROOF-1A	360785.896	5025776.273
ROOF-1A	360781.68	5025772.201
ROOF-1A	360801.862	5025754.708
ROOF-1A	360805.776	5025758.774
ROOF-1A	360806.147	5025758.447
;Part2: ROOF-1A		
ROOF-1A	360785.946	5025776.321
ROOF-1A	360785.9	5025776.269
ROOF-1A	360785.896	5025776.273
ROOF-1A	360785.946	5025776.321

```
ROOF-1B          360781.68          5025772.201
ROOF-1B          360785.946         5025776.321
ROOF-1B          360787.661         5025778.266
ROOF-1B          360807.538         5025760.763
ROOF-1B          360801.862         5025754.708
ROOF-1B          360781.68          5025772.201
ROOF-2A          360726.152         5025787.928
ROOF-2A          360774.783         5025815.591
ROOF-2A          360774.783         5025815.591
ROOF-2A          360785.068         5025797.51
ROOF-2A          360785.068         5025797.51
ROOF-2A          360780.052         5025794.501
ROOF-2A          360780.052         5025794.501
ROOF-2A          360770.687         5025810.963
ROOF-2A          360770.687         5025810.963
ROOF-2A          360734.775         5025790.536
ROOF-2A          360734.775         5025790.536
ROOF-2A          360735.047         5025790.057
ROOF-2A          360735.047         5025790.057
ROOF-2A          360735.577         5025790.359
ROOF-2A          360735.577         5025790.359
ROOF-2A          360744.668         5025774.373
ROOF-2A          360744.668         5025774.373
ROOF-2A          360740.15          5025771.959
ROOF-2A          360740.15          5025771.959
ROOF-2A          360736.437         5025769.847
ROOF-2A          360736.437         5025769.847
ROOF-2A          360726.152         5025787.928
ROOF-2B          360756.489         5025787.32
ROOF-2B          360753.563         5025792.509
ROOF-2B          360753.563         5025792.509
ROOF-2B          360771.268         5025802.491
ROOF-2B          360771.268         5025802.491
ROOF-2B          360774.194         5025797.302
ROOF-2B          360774.194         5025797.302
ROOF-2B          360756.489         5025787.32
ROOF-3A          360823.069         5025810.94
ROOF-3A          360820.181         5025808.196
ROOF-3A          360815.314         5025812.494
```

```
ROOF-3A          360809.194         5025805.553
ROOF-3A          360808.292         5025806.352
ROOF-3A          360803.557         5025810.524
ROOF-3A          360794.621         5025818.2
ROOF-3A          360800.822         5025825.284
ROOF-3A          360803.082         5025823.267
ROOF-3A          360810.226         5025831.443
ROOF-3A          360854.46          5025792.634
ROOF-3A          360848.203         5025785.541
ROOF-3A          360845.932         5025787.49
ROOF-3A          360845.559         5025787.075
ROOF-3A          360843.407         5025788.972
ROOF-3A          360845.477         5025791.471
ROOF-3A          360823.069         5025810.94
ROOF-3B          360845.477         5025791.471
ROOF-3B          360843.407         5025788.972
ROOF-3B          360843.282         5025789.082
ROOF-3B          360839.136         5025784.38
ROOF-3B          360816.846         5025803.969
ROOF-3B          360820.358         5025808.04
ROOF-3B          360820.181         5025808.196
ROOF-3B          360823.069         5025810.94
ROOF-3B          360845.477         5025791.471

;;Storage Node   X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
```

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)

****
Element Count
****
Number of rain gages 2
Number of subcatchments ... 19
Number of nodes 23
Number of links 24
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
RG-C	100C	INTENSITY	10 min.
RG-S	100S	INTENSITY	15 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
CB-1	0.10	121.00	100.00	3.0000	RG-C	CB1
CBMH2	0.05	33.00	85.71	3.0000	RG-C	CBMH2-S
DRN2A	0.05	41.00	100.00	3.0000	RG-C	103
DRN2B	0.08	27.00	71.43	3.0000	RG-C	103
GRN-1	0.03	6.32	14.29	3.0000	RG-C	103
GRN-2	0.07	14.63	14.29	3.0000	RG-C	103
GRN-3	0.02	4.76	14.29	3.0000	RG-C	103
L102A	0.12	51.00	80.00	3.0000	RG-C	L102A-S
L103A	0.05	40.00	100.00	3.0000	RG-C	L103A-S
LID-1	0.12	26.10	8.57	3.0000	RG-C	LID1A
LID-2	0.06	39.00	42.86	3.0000	RG-C	LID2
LID-3	0.08	103.00	14.29	3.0000	RG-C	LID3-U
RAMP	0.01	15.00	100.00	3.0000	RG-C	103
ROOF-1A	0.03	6.97	100.00	3.0000	RG-C	IRR-TANK
ROOF-1B	0.02	5.17	100.00	3.0000	RG-C	ROOF1-S
ROOF-2A	0.04	8.97	100.00	3.0000	RG-C	IRR-TANK2
ROOF-2B	0.01	2.72	100.00	3.0000	RG-C	ROOF2B-S
ROOF-3A	0.07	15.07	100.00	3.0000	RG-C	IRR-TANK
ROOF-3B	0.03	6.97	100.00	3.0000	RG-C	ROOF3-S

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
EX-STRM	OUTFALL	63.05	0.30	0.0	
OF-LID1	OUTFALL	62.25	0.00	0.0	
OF-LID2	OUTFALL	63.33	0.00	0.0	
100	STORAGE	63.43	1.76	0.0	
101	STORAGE	63.67	1.57	0.0	
102	STORAGE	63.79	1.47	0.0	
103	STORAGE	63.91	1.32	0.0	
CB1	STORAGE	63.72	1.78	0.0	
CBMH2-S	STORAGE	61.15	3.84	0.0	
IRR-TANK	STORAGE	80.00	1.30	0.0	
IRR-TANK2	STORAGE	80.00	1.30	0.0	
L102A-S	STORAGE	63.95	1.41	0.0	
L103A-S	STORAGE	64.03	1.30	0.0	
LID1A	STORAGE	63.09	0.45	0.0	
LID1B	STORAGE	62.58	0.46	0.0	
LID1C	STORAGE	62.00	0.45	0.0	
LID2	STORAGE	64.85	0.50	0.0	
LID3	STORAGE	63.10	0.80	0.0	
LID3-U	STORAGE	65.22	0.13	0.0	

ROOF1-S	STORAGE	100.00	0.15	0.0
ROOF2B-S	STORAGE	100.00	0.15	0.0
ROOF3-S	STORAGE	100.00	0.15	0.0
TANK	STORAGE	62.50	2.50	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
100--EX	100	EX-STRM	CONDUIT	63.9	0.5947	0.0130
101-TANK	101	TANK	CONDUIT	7.1	0.2817	0.0130
102-101	102	101	CONDUIT	25.7	0.1946	0.0130
103-102	103	102	CONDUIT	35.3	0.1983	0.0130
LID2-U--LID2	LID3-U	LID3	CONDUIT	55.3	2.7497	0.0350
CBMH2-P	CBMH2-S	103	TYPE4 PUMP			
OR1	CB1	103	TYPE4 PUMP			
IRR-TANK2-O	IRR-TANK2	103	ORIFICE			
IRR-TANK-O	IRR-TANK	103	ORIFICE			
L102A-O	L102A-S	102	ORIFICE			
L103A-O	L103A-S	102	ORIFICE			
TANK--100	TANK	100	ORIFICE			
MJ-LID1B	LID1A	LID1B	WEIR			
MJ-LID1C	LID1B	LID1C	WEIR			
MJ-OF-LID1	LID1C	OF-LID1	WEIR			
MJ-OF-LID2	LID3	OF-LID2	WEIR			
W2	TANK	100	WEIR			
W3	CB1	103	WEIR			
LID3A-O	LID2	103	OUTLET			
LID3-O	LID3	CBMH2-S	OUTLET			
OR2	LID1C	CBMH2-S	OUTLET			
ROOF1-O	ROOF1-S	IRR-TANK	OUTLET			
ROOF2B-O	ROOF2B-S	IRR-TANK2	OUTLET			
ROOF3-O	ROOF3-S	IRR-TANK	OUTLET			

****
Cross Section Summary

****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
100--EX	CIRCULAR	0.30	0.07	0.07	0.30	1	74.58
101-TANK	CIRCULAR	0.45	0.16	0.11	0.45	1	151.33
102-101	CIRCULAR	0.45	0.16	0.11	0.45	1	125.76
103-102	CIRCULAR	0.45	0.16	0.11	0.45	1	126.97
LID2-U--LID2	TRIANGULAR	0.20	0.20	0.10	2.00	1	201.50

****
Analysis Options
****

```
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 03/07/2024 00:00:00
Ending Date .............. 03/08/2024 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00
Routing Time Step ........ 1.00 sec
Variable Time Step ....... NO
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m
```

****
Runoff Quantity Continuity
****

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	0.074	71.667
Evaporation Loss	0.000	0.000
Infiltration Loss	0.017	15.992
Surface Runoff	0.057	54.736
Final Storage	0.001	1.019
Continuity Error (%)	-0.112	

****
Flow Routing Continuity
****

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.057	0.567
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.044	0.437
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.015	0.152
Final Stored Volume	0.028	0.281
Continuity Error (%)	0.029	

****
Highest Flow Instability Indexes
****

All links are stable.

****
Most Frequent Nonconverging Nodes
****

Convergence obtained at all time steps.

****
Routing Time Step Summary
****

Minimum Time Step	:	1.00 sec
Average Time Step	:	1.00 sec
Maximum Time Step	:	1.00 sec
% of Time in Steady State	:	0.00
Average Iterations per Step	:	2.00
% of Steps Not Converging	:	0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
CB-1	71.67	0.00	0.00	0.00	70.22	0.00	70.22	0.07	48.49	0.980
CBMH2	71.67	0.00	0.00	6.26	60.18	4.00	64.18	0.03	22.84	0.895
DRN2A	71.67	0.00	0.00	0.00	70.21	0.00	70.21	0.03	24.18	0.980
DRN2B	71.67	0.00	0.00	12.68	50.14	7.82	57.96	0.05	37.17	0.809
GRN-1	71.67	0.00	0.00	39.84	10.03	21.60	31.64	0.01	6.62	0.441
GRN-2	71.67	0.00	0.00	39.85	10.03	21.60	31.63			

								0.02	15.36	0.441
GRN-3	71.67	0.00	0.00	39.85	10.03	21.60	31.63	0.01	4.99	0.441
L102A	71.67	0.00	0.00	8.82	56.16	5.54	61.70	0.08	59.13	0.861
L103A	71.67	0.00	0.00	0.00	70.21	0.00	70.21	0.04	25.90	0.980
LID-1	71.67	0.00	0.00	42.65	6.01	22.89	28.91	0.03	24.51	0.403
LID-2	71.67	0.00	0.00	25.37	30.09	15.62	45.71	0.03	25.68	0.638
LID-3	71.67	0.00	0.00	37.92	10.02	23.57	33.59	0.03	33.98	0.469
RAMP	71.67	0.00	0.00	0.00	70.21	0.00	70.21	0.01	4.65	0.980
ROOF-1A	71.67	0.00	0.00	0.00	70.17	0.00	70.17	0.02	15.37	0.979
ROOF-1B	71.67	0.00	0.00	0.00	70.17	0.00	70.17	0.02	11.41	0.979
ROOF-2A	71.67	0.00	0.00	0.00	70.17	0.00	70.17	0.03	19.78	0.979
ROOF-2B	71.67	0.00	0.00	0.00	70.17	0.00	70.17	0.01	6.00	0.979
ROOF-3A	71.67	0.00	0.00	0.00	70.17	0.00	70.17	0.05	33.23	0.979
ROOF-3B	71.67	0.00	0.00	0.00	70.17	0.00	70.17	0.02	15.37	0.979

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days	hr:min	Reported Max Depth Meters
EX-STRM	OUTFALL	0.02	0.23	63.28	0	01:28	0.23
OF-LID1	OUTFALL	0.00	0.00	62.25	0	00:00	0.00
OF-LID2	OUTFALL	0.00	0.00	63.33	0	00:00	0.00
100	STORAGE	0.03	0.35	63.78	0	01:28	0.35
101	STORAGE	0.02	0.31	63.98	0	01:27	0.31
102	STORAGE	0.03	0.50	64.29	0	01:10	0.50
103	STORAGE	0.03	0.51	64.42	0	01:10	0.51
CB1	STORAGE	0.05	1.54	65.26	0	01:10	1.54
CBMH2-S	STORAGE	0.13	1.11	62.26	0	01:59	1.11
IRR-TANK	STORAGE	0.96	1.08	81.08	0	01:40	1.08
IRR-TANK2	STORAGE	0.95	1.03	81.03	0	01:55	1.03
L102A-S	STORAGE	0.04	1.16	65.11	0	01:12	1.16
L103A-S	STORAGE	0.03	1.12	65.15	0	01:10	1.12
LID1A	STORAGE	0.34	0.39	63.48	0	01:16	0.39
LID1B	STORAGE	0.34	0.39	62.97	0	01:29	0.39
LID1C	STORAGE	0.15	0.26	62.26	0	01:59	0.26
LID2	STORAGE	0.19	0.27	65.12	0	01:10	0.27
LID3	STORAGE	0.34	0.41	63.51	0	01:13	0.41
LID3-U	STORAGE	0.01	0.10	65.32	0	01:10	0.10
ROOF1-S	STORAGE	0.01	0.14	100.14	0	01:25	0.14
ROOF2B-S	STORAGE	0.00	0.12	100.12	0	01:16	0.12
ROOF3-S	STORAGE	0.01	0.14	100.14	0	01:23	0.14
TANK	STORAGE	1.03	1.48	63.98	0	01:28	1.48

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days	hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
EX-STRM	OUTFALL	0.00	85.49	0	01:28	0	0.437	0.000
OF-LID1	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr
OF-LID2	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr
100	STORAGE	0.00	85.51	0	01:27	0	0.437	0.001
101	STORAGE	0.00	169.31	0	01:10	0	0.437	-0.005

102	STORAGE	0.00	170.10	0	01:10	0	0.437	0.139
103	STORAGE	92.98	137.95	0	01:10	0.123	0.324	-0.065
CB1	STORAGE	48.49	48.49	0	01:10	0.0686	0.0686	0.015
CBMH2-S	STORAGE	22.84	28.79	0	01:10	0.0302	0.0607	0.007
IRR-TANK	STORAGE	48.60	53.12	0	01:10	0.0688	0.107	0.007
IRR-TANK2	STORAGE	19.78	21.67	0	01:10	0.028	0.0365	0.010
L102A-S	STORAGE	59.13	59.13	0	01:10	0.0761	0.0761	0.021
L103A-S	STORAGE	25.90	25.90	0	01:10	0.0367	0.0367	0.020
LID1A	STORAGE	24.51	24.51	0	01:10	0.0335	0.0335	0.003
LID1B	STORAGE	0.00	15.89	0	01:16	0	0.0236	0.005
LID1C	STORAGE	0.00	13.68	0	01:26	0	0.0164	-0.016
LID2	STORAGE	25.68	25.68	0	01:10	0.0274	0.0274	-0.002
LID3	STORAGE	0.00	32.28	0	01:10	0	0.0279	-0.001
LID3-U	STORAGE	33.98	33.98	0	01:10	0.0279	0.0279	-0.003
ROOF1-S	STORAGE	11.41	11.41	0	01:10	0.0161	0.0161	-0.003
ROOF2B-S	STORAGE	6.00	6.00	0	01:10	0.0085	0.0085	-0.005
ROOF3-S	STORAGE	15.37	15.37	0	01:10	0.0218	0.0218	-0.003
TANK	STORAGE	0.00	169.39	0	01:10	0	0.589	-0.036

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m	Max Pcnt Full	Time of Max Occurrence days	hr:min	Maximum Outflow LPS
100	0.000	1.7	0.0	0.0	0.000	19.8	0	01:28	85.49
101	0.000	1.5	0.0	0.0	0.000	20.1	0	01:27	169.39
102	0.000	2.0	0.0	0.0	0.001	34.0	0	01:10	169.31
103	0.000	2.0	0.0	0.0	0.001	38.7	0	01:10	136.44
CB1	0.000	0.3	0.0	0.0	0.015	23.1	0	01:10	22.37
CBMH2-S	0.003	3.4	0.0	0.0	0.029	28.8	0	01:59	12.62
IRR-TANK	0.058	73.8	0.0	0.0	0.065	82.7	0	01:40	9.27
IRR-TANK2	0.029	73.2	0.0	0.0	0.031	79.1	0	01:55	2.18
L102A-S	0.000	0.2	0.0	0.0	0.019	15.4	0	01:12	22.95
L103A-S	0.000	0.2	0.0	0.0	0.007	17.8	0	01:10	13.61
LID1A	0.010	65.2	0.0	0.0	0.012	81.6	0	01:16	15.89
LID1B	0.009	65.4	0.0	0.0	0.011	77.9	0	01:29	9.09
LID1C	0.004	14.0	0.0	0.0	0.011	36.3	0	01:59	2.35
LID2	0.006	24.6	0.0	0.0	0.009	38.6	0	01:10	18.99
LID3	0.009	23.6	0.0	0.0	0.012	31.3	0	01:13	17.10
LID3-U	0.000	0.0	0.0	0.0	0.000	0.0	0	00:00	32.28
ROOF1-S	0.000	4.1	0.0	0.0	0.007	76.9	0	01:25	1.89
ROOF2B-S	0.000	1.2	0.0	0.0	0.003	50.9	0	01:16	1.89
ROOF3-S	0.001	4.2	0.0	0.0	0.010	79.2	0	01:23	2.73
TANK	0.161	57.7	0.0	0.0	0.266	95.6	0	01:28	85.51

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
EX-STRM	53.60	9.43	85.49	0.437
OF-LID1	0.00	0.00	0.00	0.000
OF-LID2	0.00	0.00	0.00	0.000

System	17.87	9.43	85.49	0.437

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
100--EX	CONDUIT	85.49	0	01:28	1.30	1.15	0.88
101-TANK	CONDUIT	169.39	0	01:10	1.51	1.12	0.72
102-101	CONDUIT	169.31	0	01:10	1.21	1.35	0.82
103-102	CONDUIT	136.44	0	01:10	0.86	1.07	1.00
LID2-U--LID2	CONDUIT	32.28	0	01:10	0.66	0.16	0.50
CBMH2-P	PUMP	4.00	0	01:05		1.00	
OR1	PUMP	22.37	0	01:10		0.93	
IRR-TANK2-O	ORIFICE	2.18	0	01:55			0.10
IRR-TANK-O	ORIFICE	9.27	0	01:40			0.25
L102A-O	ORIFICE	22.95	0	01:24			1.00
L103A-O	ORIFICE	13.61	0	01:22			1.00
TANK--100	ORIFICE	85.51	0	01:27			1.00
MJ-LID1B	WEIR	15.89	0	01:16			0.45
MJ-LID1C	WEIR	9.09	0	01:29			0.31
MJ-OF-LID1	WEIR	0.00	0	00:00			0.00
MJ-OF-LID2	WEIR	0.00	0	00:00			0.00
W2	WEIR	0.00	0	00:00			0.00
W3	WEIR	0.00	0	00:00			0.00
LID3A-O	DUMMY	18.99	0	01:10			
LID3-O	DUMMY	17.10	0	01:13			
OR2	DUMMY	8.62	0	01:23			
ROOF1-O	DUMMY	1.89	0	00:57			
ROOF2B-O	DUMMY	1.89	0	01:01			
ROOF3-O	DUMMY	2.73	0	01:23			

****

Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		---------- Fraction of Time in Flow Class ----------								
100--EX	1.00	0.02	0.00	0.00	0.53	0.44	0.00	0.00	0.06	0.00
101-TANK	1.00	0.02	0.00	0.00	0.03	0.00	0.00	0.96	0.00	0.00
102-101	1.00	0.02	0.00	0.00	0.02	0.00	0.00	0.97	0.00	0.00
103-102	1.00	0.02	0.00	0.00	0.07	0.00	0.00	0.91	0.00	0.00
LID2-U--LID2	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	--------- Hours Full -------- Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
100--EX	0.01	0.40	0.01	0.58	0.01
101-TANK	0.01	0.01	0.01	0.07	0.01
102-101	0.01	0.07	0.01	0.15	0.01
103-102	0.01	0.05	0.01	0.04	0.01

****
Pumping Summary
****

Pump	Percent Utilized	Number of Start-Ups	Min Flow LPS	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr	Power Usage Kw-hr	% Time Off Pump Curve Low	High

CBMH2-P	27.88	1	0.00	2.40	4.00	0.058	0.34	0.0	0.0
OR1	12.62	1	0.00	6.29	22.37	0.069	0.13	0.0	0.0

Analysis begun on: Thu Jun 5 13:54:15 2025
Analysis ended on: Thu Jun 5 13:54:16 2025
Total elapsed time: 00:00:01

Stormwater Management Calculations

Project #160401689, 2475 Regina Street
Modified Rational Method Calculations for Storage

2 yr Intensity
City of Ottawa

I = a/(t + b)^c

a =	732.951
b =	6.199
c =	0.81

t (min)	I (mm/hr)
10	76.81
20	52.03
30	40.04
40	32.86
50	28.04
60	24.56
70	21.91
80	19.83
90	18.14
100	16.75
110	15.57
120	14.56

2 YEAR Modified Rational Method for Entire Site

Subdrainage Area: ROOF1B — Roof
Area (ha): 0.02 — Maximum Storage Depth: 150 mm
C: 0.90

tc (min)	I (5 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	Depth (mm)	
5	103.57	5.96	1.89	4.07	1.22	54.2	0.00
10	76.81	4.42	1.89	2.53	**1.52**	58.4	0.00
15	61.77	3.55	1.89	1.66	1.50	58.1	0.00
20	52.03	2.99	1.89	1.10	1.32	55.7	0.00
25	45.17	2.60	1.89	0.71	1.06	52.0	0.00
30	40.04	2.30	1.84	0.46	0.83	48.7	0.00
35	36.06	2.08	1.76	0.32	0.67	46.4	0.00
40	32.86	1.89	1.68	0.22	0.52	44.3	0.00
45	30.24	1.74	1.60	0.14	0.38	42.3	0.00
50	28.04	1.61	1.53	0.08	0.25	40.4	0.00
55	26.17	1.51	1.47	0.04	0.13	38.8	0.00
60	24.56	1.41	1.41	0.01	0.02	37.2	0.00

Storage: Roof Storage

	Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check
5-year Water Level	58.44	0.06	1.89	1.52	9.20	

Subdrainage Area: ROOF2B — Roof
Area (ha): 0.01 — Maximum Storage Depth: 150 mm
C: 0.90

tc (min)	I (5 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	Depth (mm)	
5	103.57	3.11	1.80	1.31	**0.39**	47.6	0.00
10	76.81	2.31	1.74	0.56	0.34	46.1	0.00
15	61.77	1.85	1.62	0.24	0.21	42.7	0.00
20	52.03	1.56	1.49	0.07	0.09	39.3	0.00
25	45.17	1.36	1.40	0.00	0.00	36.9	0.00
30	40.04	1.20	1.40	0.00	0.00	36.9	0.00
35	36.06	1.08	1.40	0.00	0.00	36.9	0.00
40	32.86	0.99	1.40	0.00	0.00	36.9	0.00
45	30.24	0.91	1.40	0.00	0.00	36.9	0.00
50	28.04	0.84	1.40	0.00	0.00	36.9	0.00
55	26.17	0.79	1.40	0.00	0.00	36.9	0.00
60	24.56	0.74	1.40	0.00	0.00	36.9	0.00

Storage: Roof Storage

	Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check
5-year Water Level	47.60	0.05	1.80	0.39	4.80	

Subdrainage Area: ROOF3B — Roof
Area (ha): 0.03 — Maximum Storage Depth: 150 mm
C: 0.90

tc (min)	I (5 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	Depth (mm)	
5	103.57	8.03	1.95	6.08	1.82	56.1	0.00
10	76.81	5.96	2.01	3.95	2.37	61.9	0.00
15	61.77	4.79	2.02	2.77	**2.50**	63.2	0.00
20	52.03	4.04	2.01	2.02	2.43	62.5	0.00
25	45.17	3.50	1.99	1.51	2.26	60.8	0.00
30	40.04	3.11	1.97	1.13	2.04	58.4	0.00
35	36.06	2.80	1.95	0.85	1.78	55.7	0.00
40	32.86	2.55	1.92	0.63	1.51	52.8	0.00
45	30.24	2.35	1.89	0.46	1.23	49.9	0.00
50	28.04	2.17	1.82	0.35	1.06	48.1	0.00
55	26.17	2.03	1.76	0.27	0.90	46.4	0.00
60	24.56	1.90	1.70	0.21	0.75	44.8	0.00

Storage: Roof Storage

	Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check
5-year Water Level	63.20	0.06	2.02	2.50	12.40	

Project #160401689, 2475 Regina Street
Modified Rational Method Calculations for Storage

100 yr Intensity
City of Ottawa

I = a/(t + b)^c

a =	1735.688
b =	6.014
c =	0.820

t (min)	I (mm/hr)
10	178.56
20	119.95
30	91.87
40	75.15
50	63.95
60	55.89
70	49.79
80	44.99
90	41.11
100	37.90
110	35.20
120	32.89

100 YEAR Modified Rational Method for Entire Site

Subdrainage Area: ROOF1B — Roof
Area (ha): 0.02 — Maximum Storage Depth: 150 mm
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	Depth (mm)	
10	178.56	11.42	1.89	9.52	5.71	118.0	0.00
20	119.95	7.67	1.89	5.78	6.93	135.3	0.00
30	91.87	5.87	1.89	3.98	**7.17**	138.6	0.00
40	75.15	4.80	1.89	2.91	6.99	136.1	0.00
50	63.95	4.09	1.89	2.20	6.59	130.4	0.00
60	55.89	3.57	1.89	1.68	6.05	122.8	0.00
70	49.79	3.18	1.89	1.29	5.42	113.8	0.00
80	44.99	2.88	1.89	0.98	4.72	103.9	0.00
90	41.11	2.63	1.89	0.74	3.97	93.3	0.00
100	37.90	2.42	1.89	0.53	3.18	82.1	0.00
110	35.20	2.25	1.89	0.36	2.36	70.5	0.00
120	32.89	2.10	1.89	0.21	1.52	58.4	0.00

Storage: Roof Storage

	Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check
100-year Water Level	138.60	0.14	1.89	7.17	9.20	

Subdrainage Area: ROOF2B — Roof
Area (ha): 0.01 — Maximum Storage Depth: 150 mm
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	Depth (mm)	
10	178.56	5.96	1.89	4.06	2.44	103.2	0.00
20	119.95	4.00	1.89	2.11	**2.53**	105.7	0.00
30	91.87	3.06	1.89	1.17	2.11	94.3	0.00
40	75.15	2.51	1.89	0.61	1.47	77.0	0.00
50	63.95	2.13	1.89	0.24	0.72	56.6	0.00
60	55.89	1.86	1.77	0.10	0.36	46.6	0.00
70	49.79	1.66	1.61	0.05	0.21	42.6	0.00
80	44.99	1.50	1.48	0.02	0.08	39.2	0.00
90	41.11	1.37	1.40	0.00	0.00	36.9	0.00
100	37.90	1.26	1.40	0.00	0.00	36.9	0.00
110	35.20	1.17	1.40	0.00	0.00	36.9	0.00
120	32.89	1.10	1.40	0.00	0.00	36.9	0.00

Storage: Roof Storage

	Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check
100-year Water Level	105.74	0.11	1.89	2.53	4.80	

Subdrainage Area: ROOF3B — Roof
Area (ha): 0.03 — Maximum Storage Depth: 150 mm
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	Depth (mm)	
10	178.56	15.39	2.54	12.85	7.71	118.1	0.00
20	119.95	10.34	2.68	7.65	9.18	133.6	0.00
30	91.87	7.92	2.70	5.21	**9.38**	135.7	0.00
40	75.15	6.48	2.68	3.80	9.12	132.9	0.00
50	63.95	5.51	2.63	2.88	8.64	127.9	0.00
60	55.89	4.82	2.57	2.24	8.08	121.9	0.00
70	49.79	4.29	2.51	1.78	7.47	115.5	0.00
80	44.99	3.88	2.45	1.43	6.85	109.0	0.00
90	41.11	3.54	2.39	1.15	6.23	102.5	0.00
100	37.90	3.27	2.33	0.94	5.62	96.1	0.00
110	35.20	3.03	2.27	0.76	5.04	89.9	0.00
120	32.89	2.83	2.21	0.62	4.47	84.0	0.00

Storage: Roof Storage

	Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check
100-year Water Level	135.71	0.14	2.70	9.38	12.40	

Project #160401689, 2475 Regina Street
Roof Drain Design Sheet, Area ROOF1
Watts Adjustable Accutrol Weir

Rating Curve				Volume Estimation				
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m) Increment	Volume (cu. m) Accumulated	Water Depth (m)
0.000	0.0000	0.0000	0	0.000	0	0	0	0.000
0.025	0.0003	0.0009	0	0.025	5	0	0	0.025
0.050	0.0006	0.0019	0	0.050	20	0	0	0.050
0.075	0.0006	0.0019	1	0.075	46	1	1	0.075
0.100	0.0006	0.0019	3	0.100	82	2	3	0.100
0.125	0.0006	0.0019	5	0.125	128	3	5	0.125
0.150	0.0006	0.0019	9	0.150	184	4	9	0.150

Drawdown Estimate

Total Volume (cu.m)	Total Time (sec)	Vol (cu.m)	Detention Time (hr)
0.0	0.0	0.0	0
0.3	157.5	0.3	0.04376
1.1	427.6	0.8	0.16253
2.7	832.6	1.6	0.39381
5.3	1372.7	2.6	0.77512
9.2	2047.8	3.9	1.34396

Rooftop Storage Summary

Total Building Area (sq.m)		230
Assume Available Roof Area (sq.	80%	184
Roof Imperviousness		0.99
Roof Drain Requirement (sq.m/Notch)		232
Number of Roof Notches*		3
Max. Allowable Depth of Roof Ponding (m)		0.15
Max. Allowable Storage (cu.m)		9
Estimated 100 Year Drawdown Time (h)		1.1

* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).

* Note: Number of drains can be reduced if multiple-notch drain used.

From Watts Drain Catalogue

Head (m) L/s

Head (m)	Open	0.75	0.5	0.25	**Closed**
0.025	0.3155	0.3155	0.3155	0.3155	**0.3155**
0.05	0.6309	0.6309	0.6309	0.6309	**0.6309**
0.075	0.9464	0.8675	0.7886	0.7098	**0.6309**
0.1	1.2618	1.1041	0.9464	0.7886	**0.6309**
0.125	1.5773	1.3407	1.1041	0.8675	**0.6309**
0.15	1.8927	1.5773	1.2618	0.9464	**0.6309**

Calculation Results

	5yr	100yr	Available
Qresult (cu.m/s)	0.001	0.002	-
Depth (m)	0.058	0.139	0.150
Volume (cu.m)	1.5	7.2	9.2
Draintime (hrs)	0.2	1.1	

Project #160401689, 2475 Regina Street
Roof Drain Design Sheet, Area ROOF2
Watts Adjustable Accutrol Weir

Rating Curve				Volume Estimation				Water Depth
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m) Increment	Volume (cu. m) Accumulated	Water Depth (m)
0.000	0.0000	0.0000	0	0.000	0	0	0	0.000
0.025	0.0003	0.0009	0	0.025	3	0	0	0.025
0.050	0.0006	0.0019	0	0.050	11	0	0	0.050
0.075	0.0006	0.0019	1	0.075	24	0	1	0.075
0.100	0.0006	0.0019	1	0.100	43	1	1	0.100
0.125	0.0006	0.0019	3	0.125	67	1	3	0.125
0.150	0.0006	0.0019	5	0.150	96	2	5	0.150

Drawdown Estimate

Total Volume (cu.m)	Total Time (sec)	Vol (cu.m)	Detention Time (hr)
0.0	0.0	0.0	0
0.2	82.2	0.2	0.02283
0.6	223.1	0.4	0.0848
1.4	434.4	0.8	0.20547
2.8	716.2	1.4	0.40441
4.8	1068.4	2.0	0.7012

Rooftop Storage Summary

Total Building Area (sq.m)		120
Assume Available Roof Area (sq.	80%	96
Roof Imperviousness		0.99
Roof Drain Requirement (sq.m/Notch)		232
Number of Roof Notches*		3
Max. Allowable Depth of Roof Ponding (m)		0.15
Max. Allowable Storage (cu.m)		5
Estimated 100 Year Drawdown Time (h)		0.4

* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).

* Note: Number of drains can be reduced if multiple-notch drain used.

From Watts Drain Catalogue

Head (m) L/s

Head (m)	Open	0.75	0.5	0.25	**Closed**
0.025	0.3155	0.3155	0.3155	0.3155	**0.3155**
0.05	0.6309	0.6309	0.6309	0.6309	**0.6309**
0.075	0.9464	0.8675	0.7886	0.7098	**0.6309**
0.1	1.2618	1.1041	0.9464	0.7886	**0.6309**
0.125	1.5773	1.3407	1.1041	0.8675	**0.6309**
0.15	1.8927	1.5773	1.2618	0.9464	**0.6309**

Calculation Results

	5yr	100yr	Available
Qresult (cu.m/s)	0.001	0.002	-
Depth (m)	0.048	0.106	0.150
Volume (cu.m)	0.4	2.5	4.8
Draintime (hrs)	0.1	0.4	

Project #160401689, 2475 Regina Street
Roof Drain Design Sheet, Area ROOF3
Watts Adjustable Accutrol Weir

Rating Curve				Volume Estimation				Water Depth
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m) Increment	Volume (cu. m) Accumulated	Water Depth (m)
0.000	0.0000	0.0000	0	0.000	0	0	0	0.000
0.025	0.0003	0.0009	0	0.025	7	0	0	0.025
0.050	0.0006	0.0019	0	0.050	28	0	0	0.050
0.075	0.0007	0.0021	2	0.075	62	1	2	0.075
0.100	0.0008	0.0024	4	0.100	110	2	4	0.100
0.125	0.0009	0.0026	7	0.125	172	4	7	0.125
0.150	0.0009	0.0028	12	0.150	248	5	12	0.150

Drawdown Estimate

Total Volume (cu.m)	Total Time (sec)	Vol (cu.m)	Detention Time (hr)
0.0	0.0	0.0	0
0.4	212.3	0.4	0.05898
1.5	512.3	1.1	0.20127
3.6	897.8	2.1	0.45066
7.1	1345.6	3.5	0.82443
12.3	1840.1	5.2	1.33556

Rooftop Storage Summary

Total Building Area (sq.m)		310
Assume Available Roof Area (sq.	80%	248
Roof Imperviousness		0.99
Roof Drain Requirement (sq.m/Notch)		232
Number of Roof Notches*		3
Max. Allowable Depth of Roof Ponding (m)		0.15
Max. Allowable Storage (cu.m)		12
Estimated 100 Year Drawdown Time (h)		1.0

* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).

* Note: Number of drains can be reduced if multiple-notch drain used.

From Watts Drain Catalogue

Head (m) L/s

Head (m)	Open	0.75	0.5	**0.25**	Closed
0.025	0.3155	0.3155	0.3155	**0.3155**	0.3155
0.05	0.6309	0.6309	0.6309	**0.6309**	0.6309
0.075	0.9464	0.8675	0.7886	**0.7098**	0.6309
0.1	1.2618	1.1041	0.9464	**0.7886**	0.6309
0.125	1.5773	1.3407	1.1041	**0.8675**	0.6309
0.15	1.8927	1.5773	1.2618	**0.9464**	0.6309

Calculation Results

	5yr	100yr	Available
Qresult (cu.m/s)	0.002	0.003	-
Depth (m)	0.063	0.136	0.150
Volume (cu.m)	2.5	9.4	12.4
Draintime (hrs)	0.3	1.0	

WATTS®	Adjustable Accutrol Weir Tag: ____________	Adjustable Flow Control for Roof Drains

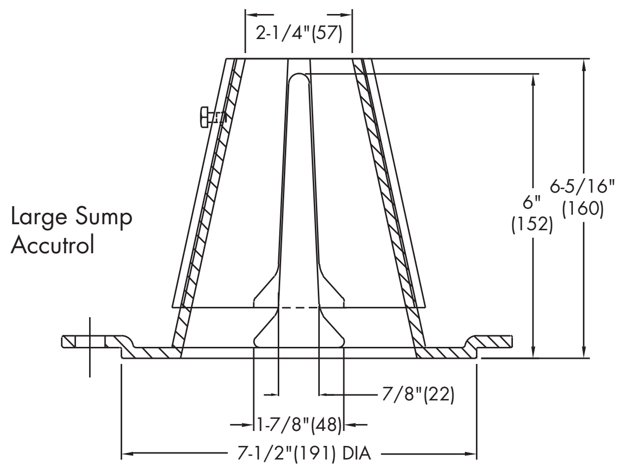
ADJUSTABLE ACCUTROL (for Large Sump Roof Drains only)

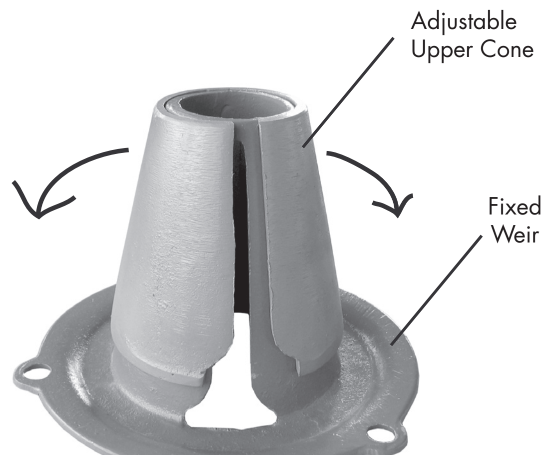
For more flexibility in controlling flow with heads deeper than 2", Watts Drainage offers the Adjustable Accutrol. The Adjustable Accutrol Weir is designed with a single parabolic opening that can be covered to restrict flow above 2" of head to less than 5 gpm per inch, up to 6" of head. To adjust the flow rate for depths over 2" of head, set the slot in the adjustable upper cone according to the flow rate required. Refer to Table 1 below.
Note: Flow rates are directly proportional to the amount of weir opening that is exposed.

EXAMPLE:

For example, if the adjustable upper cone is set to cover 1/2 of the weir opening, flow rates above 2"of head will be restricted to 2-1/2 gpm per inch of head.

Therefore, at 3"of head, the flow rate through the Accutrol Weir that has 1/2 the slot exposed will be:
[5 gpm (per inch of head) x 2 inches of head] + 2-1/2 gpm (for the third inch of head) = 12-1/2 gpm.





1/2 Weir Opening Exposed Shown Above

TABLE 1. Adjustable Accutrol Flow Rate Settings

Weir Opening Exposed	1"	2"	3"	4"	5"	6"
	Flow Rate (gallons per minute)					
Fully Exposed	5	10	15	20	25	30
3/4	5	10	13.75	17.5	21.25	25
1/2	5	10	12.5	15	17.5	20
1/4	5	10	11.25	12.5	13.75	15
Closed	5	5	5	5	5	5

Job Name ____________ Contractor ____________

Job Location ____________ Contractor's P.O. No. ____________

Engineer ____________ Representative ____________

WATTS®
A Watts Water Technologies Company

USA: Tel: (800) 338-2581 • Fax: (828) 248-3929 • Watts.com
Canada: Tel: (905) 332-4090 • Fax: (905) 332-7068 • Watts.ca
Latin America: Tel: (52) 81-1001-8600 • Fax: (52) 81-8000-7091 • Watts.com

Next Generation Inlet Control Devices

TEMPEST™
INLET CONTROL DEVICES

STORMWATER MANAGEMENT SYSTEMS

THE SOLUTION FOR STORMWATER POLLUTION

- Mainenance free system with no moving parts
- Designed to handle a wide range of flows
- Fast and easy to install and maintain

IPEX

We build tough products for tough environments®

CONTROL SANITARY BACK-UP DURING PEAK FLOW EVENTS

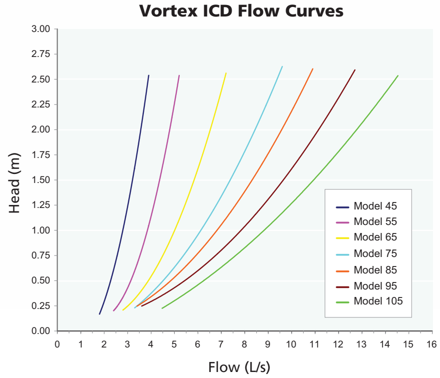
Cities across North America are designed with a significant number of catch basins connected to combined sewers. When a substantial rain occurs, combined sewers are overloaded with stormwater and cause sanitary back up in houses, lakes and streams. This is a major environmental concern.

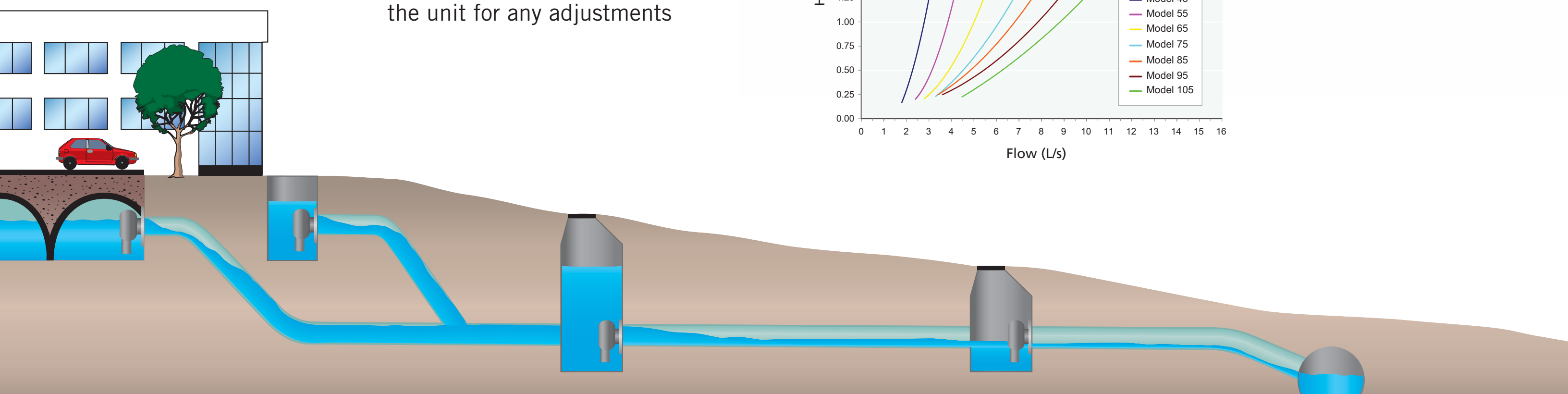
The Tempest™ line of Inlet Control Devices (ICD's) is used to control flow into storm sewers during these peak flow events. Tempest ICD's are designed to allow a specific flow volume out of a catchbasin or manhole at a specified head. This causes the excess stormwater to be temporarily stored in the upstream piping system or above ground. Avoid environmental and structural degradation by conserving pipe capacity so that downstream infrastructure does not become uncontrollably surcharged.

TEMPEST™ Vortex ICD

Available in seven pre-set flow rates, ranging from 2 l/s to 17 l/s (0.07 cfs to 0.60 cfs). The Tempest Vortex Inlet Control Device allows a near constant discharge rate to be set. These devices are easily installed over the catchbasin outlet pipe, and include a quick release mechanism to allow easy access for maintenance without the need to drain the installation. The Vortex ICD is designed specifically for low to moderate flow rates with an engineered design that eliminates the passage of odours and floatables.

- Restricts flow to a narrow range
- Prevents propagation of floatables & odour through the system
- Simple insert adjustment changes flow rate capacity
- Virtually maintenance free with no moving parts
- Neoprene gasket for air-tight seal
- Utilize a reach bar and simply lift out the unit for any adjustments





TEMPEST™ F.O.F ICD

The Tempest F.O.F (floatable, odour and flow) unit meets the needs of typically larger flows of 15L/s (0.53 cfs) or greater.

- Restricts the passage of floatables, odour and flow
- Easily installed over existing catch basin outlet pipe
- Neoprene gasket for air-tight seal
- Utilize a reach bar to simply lift out the unit for any adjustments

TEMPEST™ Plate ICD

The Tempest Plate ICD is a standard orifice plate device designed to allow a specified flow volume out of a catchbasin at a specified head.

- Restricts flow

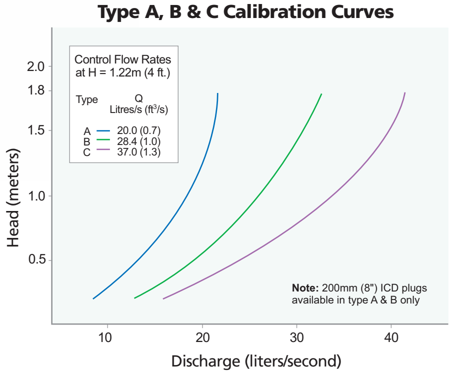
TEMPEST™ SUMP

Designed for catchbasins & manholes in which there is no sump or the outlet pipe is too low to install F.O.F device. The Tempest SUMP system raises the outlet off the bottom allowing for debris and sediment to collect in the structure.

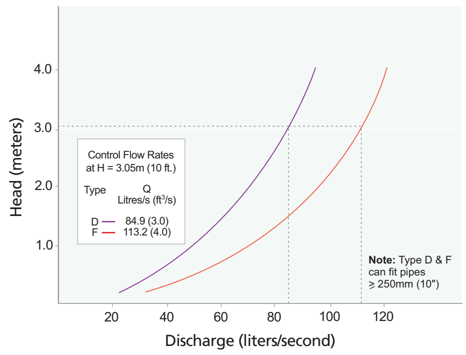
- Creates sump in structure
- Restricts the passage of floatables, odor and flow
- Easily installed over existing catchbasin outlet pipe

TEMPEST F.O.F, PLATE AND SUMP FLOW CURVES

Type A, B & C Calibration Curves



Type D & F Calibration Curves



SALES AND CUSTOMER SERVICE

Canadian Customers call IPEX Inc.
Toll free: (866) 473-9462
www.ipexinc.com

U.S. Customers call IPEX USA LLC
Toll free: (800) 463-9572
www.ipexamerica.com

About the IPEX Group of Companies

As leading suppliers of thermoplastic piping systems, the IPEX Group of Companies provides our customers with some of the largest and most comprehensive product lines. All IPEX products are backed by more than 50 years of experience. With state-of-the-art manufacturing facilities and distribution centers across North America, we have established a reputation for product innovation, quality, end-user focus and performance.

Markets served by IPEX group products are:

- Electrical systems
- Telecommunications and utility piping systems
- PVC, PVCO, CPVC, PP, ABS, PEX, FR-PVDF and PE pipe and fittings (1/4" to 48")
- Industrial process piping systems
- Municipal pressure and gravity piping systems
- Plumbing and mechanical piping systems
- PE Electrofusion systems for gas and water
- Industrial, plumbing and electrical cements
- Irrigation systems

Products manufactured for IPEX Inc. and distributed in the US by IPEX USA LLC.

IPEX

D.3 Excerpts from the SWM Design Criteria for the Pinecrest Creek/Westboro Area (City of Ottawa, May 2020)

Stormwater Management Design Criteria

for the Pinecrest Creek/Westboro Area

City of Ottawa

Final – May 2020

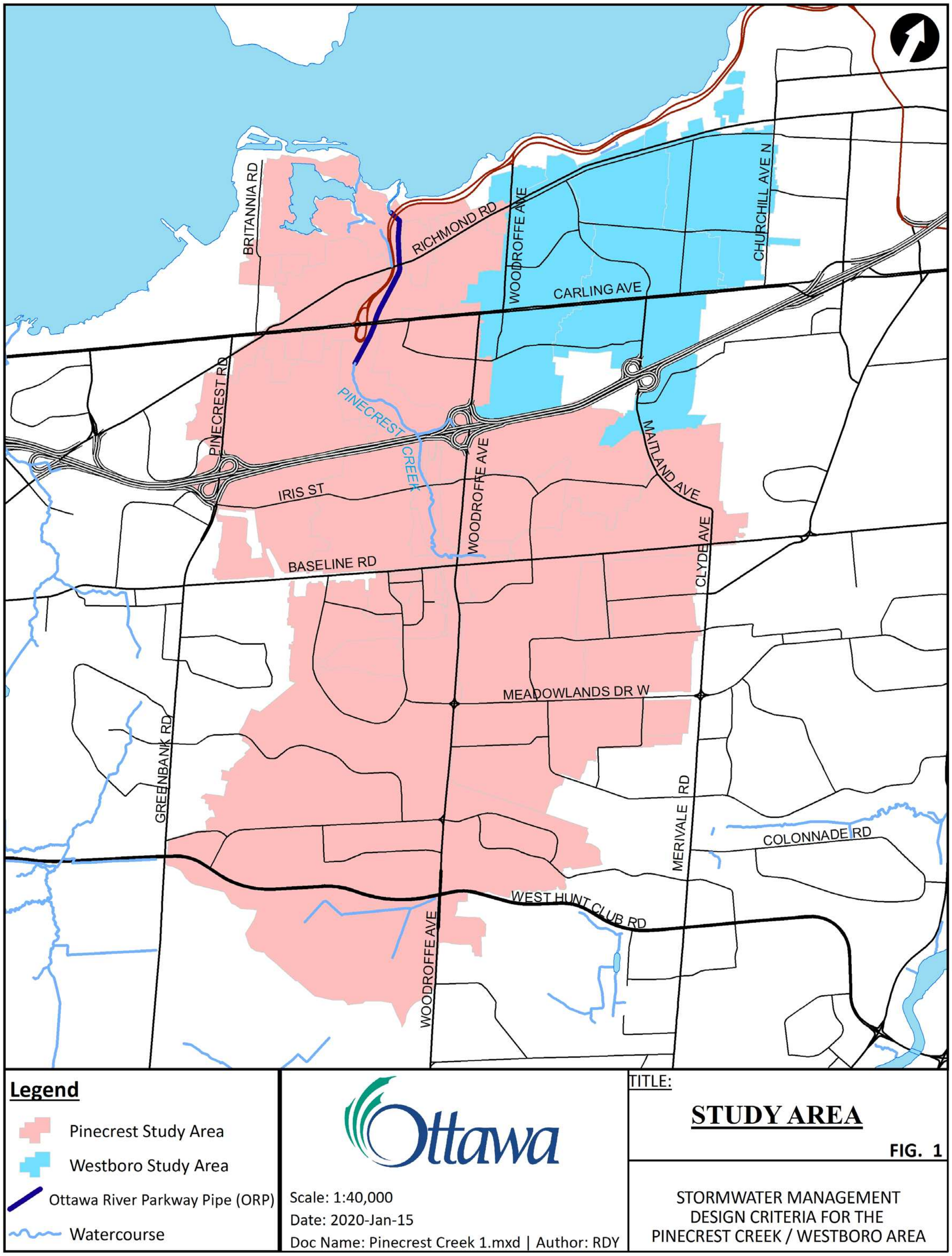


Figure 1: Study Area

Table 1: SWM Design Criteria for the Pinecrest Creek / Westboro Study Area

Development Type		Runoff Volume Reduction	Water Quality	Water Quantity	
			TSS Removal	Flood Control	Erosion Control
All Locations					
Residential Development *not* subject to Plan of Subdivision or Site Plan Control approval(s)					
1	all soil infiltration rates	Direction/re-direction of downspouts/roof drainage to discharge to pervious surfaces, where possible, to reduce runoff, while meeting all other City of Ottawa lot grading requirements. Amended topsoil, or a depth of topsoil up to 300 mm, provides runoff volume reduction benefits and is encouraged (but not mandatory) as a best practice over all soft landscaped surfaces.	Not applicable	Not applicable	Not applicable
Draining to the Ottawa River					
Development subject to Plan of Subdivision or Site Plan Control approval(s) - discharging directly to the Ottawa River					
2	all soil infiltration rates	A minimum on-site retention of the 10 mm design storm; refer to LID references(i) for guidance on prudent approach to planning infiltration-based LID best management practices. Assumptions re: non-viability of infiltration measures must be substantiated. A green roof, rain harvesting measures and/or a combination of detention/retention measures(ii) could be implemented to provide further runoff volume reduction.	On-site removal of 80% of TSS; some of which ma be achieved by on-site retention of first 10 mm of rainfall.	As per City of Ottawa Sewer Design Guideline	Not applicable
Draining to Pinecrest Creek					
Development subject to Plan of Subdivision or Site Plan Control approval(s) - discharging upstream of the Ottawa River Parkway pipe (ORPP) inlet					
3	all soil infiltration rates	A minimum on-site retention of the 10 mm design storm; refer to LID references(i) for guidance on prudent approach to planning infiltration-based LID best management practices. Assumptions re: non-viability of infiltration measures must be substantiated. A green roof, rain harvesting measures and/or a combination of detention/retention measures(ii) could be implemented to provide further runoff volume reduction.	On-site removal of 80% of TSS; some of which may be achieved by on-site retention of first 10 mm of rainfall and detention of the 25 mm design storm(iii).	The more stringent of the following criteria will govern: i) 1:100 year discharge from site not to exceed 33.5 L/s/ha) or; ii) Requirements of City of Ottawa Sewer Design Guideline.	Control (detain) the runoff from the 25 mm design storm(iii) such that the peak outflow from the site does not exceed 5.8 L/s/ha.
Development subject to Plan of Subdivision or Site Plan Control approval(s) - discharging directly to the Ottawa River Parkway pi					
4	all soil infiltration rates	A minimum on-site retention of the 10 mm design storm; refer to LID references(i) for guidance on prudent approach to planning infiltration-based LID best management practices. Assumptions re: non-viability of infiltration measures must be substantiated. A green roof, rain harvesting measures and/or a combination of detention/retention measures(ii) could be implemented to provide further runoff volume reduction.	On-site removal of 80% of TSS; some of which may be achieved by on-site retention of first 10 mm of rainfall.	The more stringent of the following criteria will govern: i) 1:100 year discharge from site not to exceed 33.5 L/s/ha) or; ii) Requirements of City of Ottawa Sewer Design	Not applicable

Notes:

(i) Re: Infiltration measures: Beyond the targets specified in this table, the planning, design and use of these systems shall be in accordance with the guidance in the Stormwater Management Planning and Design Manual (MOE, 2003); the Low Impact Development Stormwater Management Planning and Design Guide (CVC and TRCA, 2010); the Low Impact Development Stormwater Management Planning and Design Wiki at: wiki.sustainabletechnologies.ca; and Draft No.2 Low Impact Development (LID) Stormwater Management Guidance Manual (MOECC, November 2017) or the final version of this Manual, when available. As noted in the MOECC LID SWM Guidance Manual, a prudent approach to planning infiltration-based LID best management practices on any site involves delineating catchment areas that contain high risk site activities and isolating them by applying non-infiltration-based practices to these areas.

(ii) Retention is to hold or retain stormwater on a more permanent basis such as for infiltration to the surrounding soils. Detention is the temporary storage or detaining of stormwater for eventual release to the downstream system.

(iii) 25 mm 4-hour Chicago design storm

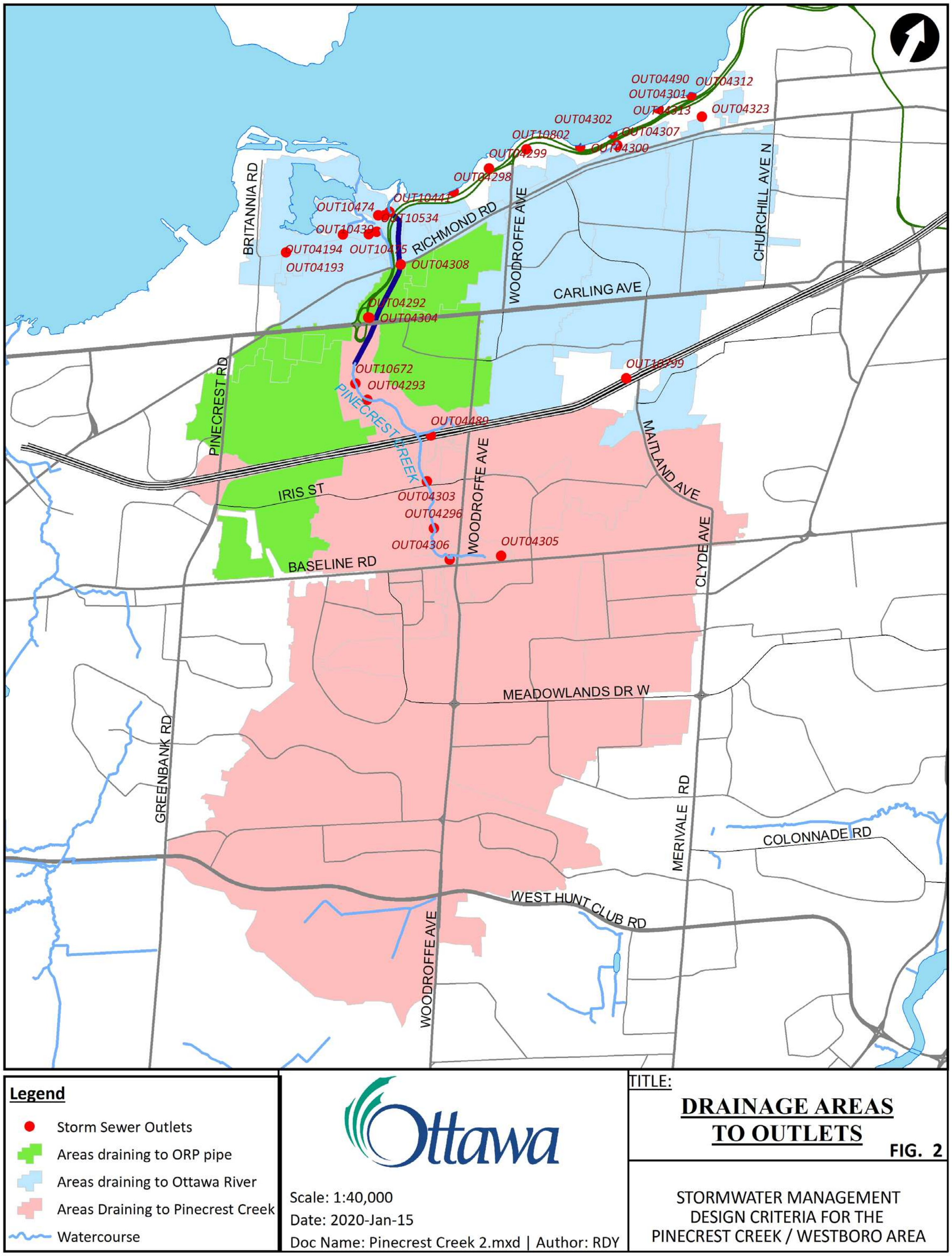


Figure 2: Drainage Areas to Outlets

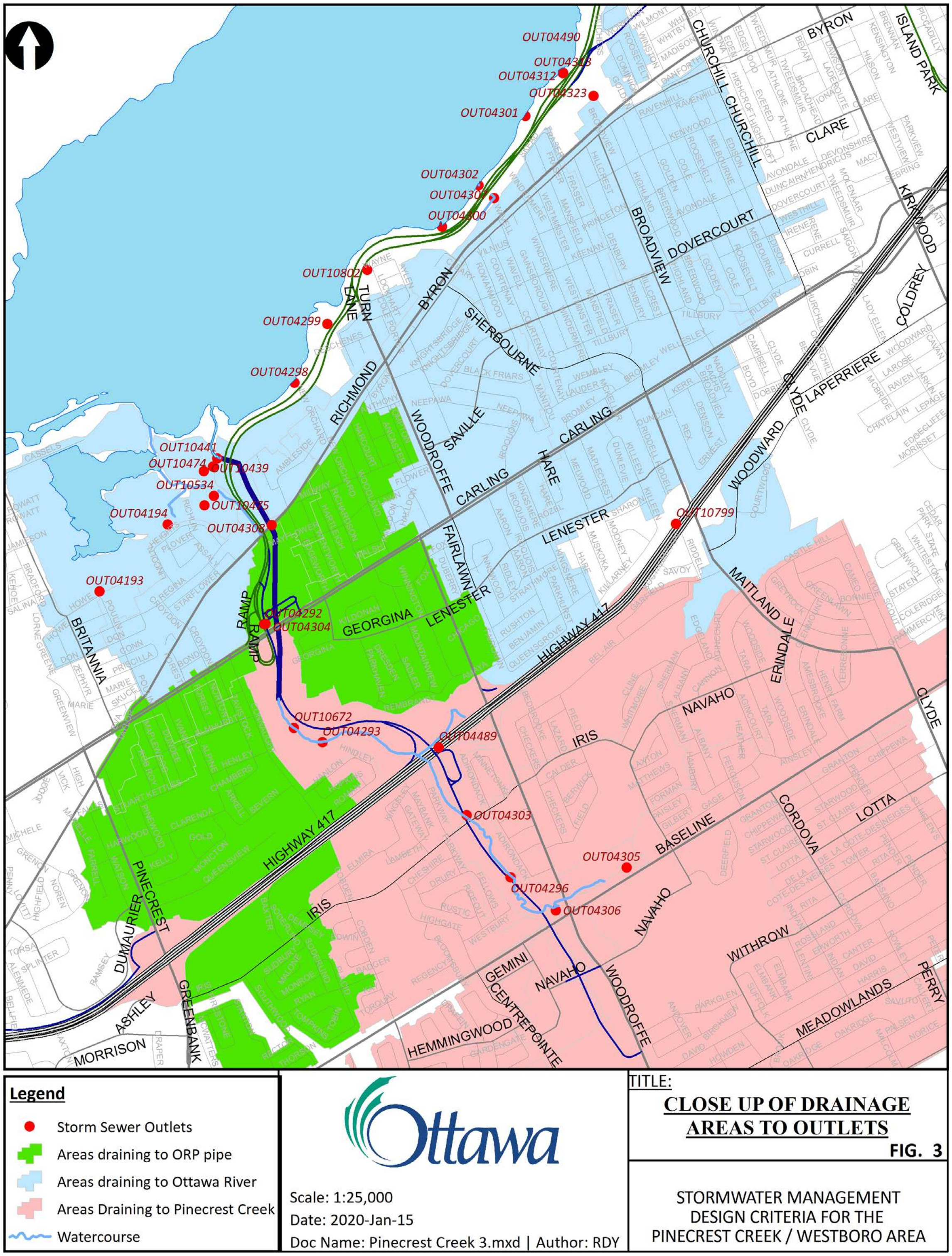


Figure 3: Close-up of Drainage Areas to Outlets

Note that, as outlined in **Table 1**, all development draining to Pinecrest Creek upstream of the ORPP shall control site runoff from the 25 mm 4-hour Chicago storm to a peak unit outflow rate of 5.8 L/s/ha regardless of whether the first 10 mm of runoff volume will be retained on-site. The required on-site storage volume, to control the runoff from the 25 mm storm, will vary from site to site based on the amount of volume retained or infiltrated.

3.4.2 Draining Directly to the Ottawa River (Water Quality)

The following runoff volume control criterion applies to catchments discharging directly to the Ottawa River. Those catchments are shown on **Figures 2** and **3**.

To mitigate the cumulative impacts of infill and redevelopment and not aggravate existing water quality degradation, development shall capture and retain (infiltrate or abstract) the first 10 mm of rainfall. This 10 mm target can be partially achieved by the default initial abstraction (IA) values applicable in urban areas. The Sewer Design Guideline allows a designer to account for a 4.67 mm IA on all soft landscaped surfaces and a 1.57 mm IA on all hardscaped surfaces. Refer to the references cited in the notes of **Table 1** for guidance on prudent approaches to planning infiltration-based LID measures. A green roof or roofs, rain harvesting measures and/or a combination of retention measures could be implemented to provide further runoff volume control.

3.5 Quality Control

Enhanced level of treatment (equivalent to long-term average TSS removal of 80%) is required for water quality control. This requirement may, in some cases, be accomplished by means of conventional measures (e.g., with a combination of end-of-pipe facilities such as oil/grit separators and filters). The water quality benefits of runoff volume control are also recognized in the *Draft No.2 LID SWM Guidance Manual (MOECC, 2017*)*,* which notes that SWM measures that achieve control of the regionally specific 90th percentile event (27mm for Ottawa) shall be considered to have achieved Enhanced level of treatment for the respective contributing drainage area.

Appendix E Background Reports

patersongroup

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Noise and Vibration Studies

Geotechnical Investigation

Proposed Mixed-Use Development
2475 Regina Street
Ottawa, Ontario

Prepared For

Parkway House Development Fund LP

June 13, 2025

Report: PG5901-1
Revision 2

Paterson Group Inc.
Consulting Engineers
154 Colonnade Road South
Ottawa (Nepean), Ontario
Canada K2E 7J5

Tel: (613) 226-7381
Fax: (613) 226-6344
www.patersongroup.ca

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is considered suitable for the proposed development. It is recommended that the proposed high-rise buildings be founded on raft foundations placed on the undisturbed, compact to dense glacial till deposit. It is further recommended that the mid-rise building, as well as the portions of the underground parking levels which extend beyond the footprints of the high-rise buildings, be supported on conventional spread footings bearing on the undisturbed, compact to dense glacial till deposit.

Where loose and/or soft glacial till is encountered at the underside of footing or raft, it should be sub-excavated to the undisturbed, compact to dense glacial till and re-instated with engineered fill.

Further, it is anticipated that cobbles and boulders will be encountered frequently throughout servicing trenches and building excavations. All contractors should be prepared for the removal of boulders and potentially oversized boulders throughout the subject site.

The above and other considerations are discussed in the following sections.

5.2 Site Grading and Preparation

Stripping Depth

Topsoil and deleterious fill, such as those containing organic materials, should be stripped from under any buildings, paved areas, pipe bedding and other settlement sensitive structures.

Existing foundation walls and other construction debris should be entirely removed from within the building perimeters. Under paved areas, existing construction remnants such as foundation walls should be excavated to a minimum of 1 m below final grade.

Protection of Subgrade (Raft Foundation)

Where a raft foundation is used, the raft subgrade would consist of a glacial till deposit, and it is recommended that a minimum 75 mm thick lean concrete mud slab be placed on the undisturbed glacial till subgrade shortly after the completion of the excavation. The main purpose of the mud slab is to reduce the risk of disturbance of the subgrade under the traffic of workers and equipment.

The final excavation to the raft bearing surface level and the placing of the mud slab should be done in smaller sections to avoid exposing large areas of the glacial till to potential disturbance due to drying.

Fill Placement

Fill placed for grading beneath the proposed buildings should consist, unless otherwise specified, of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. The imported fill material should be tested and approved prior to delivery. The fill should be placed in maximum 300 mm thick loose lifts and compacted by suitable compaction equipment. Fill placed beneath the building should be compacted to a minimum of 98% of the standard Proctor maximum dry density (SPMDD).

Non-specified existing fill along with site-excavated soil could be placed as general landscaping fill and beneath exterior parking where settlement of the ground surface is of minor concern. These materials should be spread in lifts with a maximum thickness of 300 mm and compacted by the tracks of the spreading equipment to minimize voids. If this material is to be used to build up the subgrade level for areas to be paved, it should be compacted in thin lifts to at least 95% of the material's SPMDD.

Non-specified existing fill and site-excavated soils are not suitable for placement as backfill against foundation walls, unless used in conjunction with a geocomposite drainage membrane, such as Miradrain G100N or Delta Drain 6000, connected to a perimeter drainage system.

5.3 Foundation Design

Conventional Spread Footings – Building A1

For the mid-rise building (Building A1), it is recommended that conventional spread footings placed on an undisturbed, compact to dense glacial till bearing surface can be designed using a bearing resistance value at serviceability limit states (SLS) of **200 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **300 kPa**. A geotechnical resistance factor of 0.5 was applied to the above noted bearing resistance value at ULS.

Conventional Spread Footings – Buildings T1 & T2

Conventional spread footings for buildings with more than one underground parking level (Buildings T1 & T2) will be founded on an undisturbed, dense to very dense glacial till bearing surface and can be designed using a bearing resistance value at serviceability limit states (SLS) of **300 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **450 kPa**. A geotechnical resistance factor of 0.5 was applied to the above noted bearing resistance value at ULS.

An undisturbed soil bearing surface consists of one from which all topsoil and deleterious materials, such as loose, frozen, or disturbed soil, whether in situ or not, have been removed, in the dry, prior to the placement of concrete for footings.

Footings bearing on an undisturbed soil bearing surface and designed using the bearing resistance values provided above will be subjected to potential post-construction total and differential settlements of 25 to 20 mm, respectively.

The bearing medium under footing-supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Adequate lateral support is provided to an undisturbed glacial till bearing surface, above the groundwater table, when a plane extending down and out from the bottom edge of the footing at a minimum of 1.5H:1V passes only through in situ soil of the same or higher capacity as the bearing medium soil.

Raft Foundation - High-Rise Buildings with Two Underground Parking Levels

For the proposed high-rise buildings, where the spread footing bearing capacity is not sufficient to support the imposed structural loads, then consideration could be given to using a raft foundation for foundation support of these proposed buildings. For 2 levels of underground parking, it is anticipated that the excavation will extend to a depth such that the underside of the raft slab would be placed between approximate geodetic elevations of 57 to 55 m.

The maximum SLS contact pressure is **400 kPa** for a raft foundation bearing on the undisturbed, compact to dense glacial till. It should be noted that the weight of the raft slab and everything above has to be included when designing with this value. The loading conditions for the contact pressure are based on sustained loads, that are generally taken to be 100% Dead Load and 50% Live Load. The factored bearing resistance (contact pressure) at ULS can be taken as **600 kPa**. A geotechnical resistance factor of 0.5 was applied to the bearing resistance value at ULS.

The modulus of subgrade reaction was calculated to be **16 MPa/m** for a contact pressure of 400 kPa. The design of the raft foundation is required to consider the relative stiffness of the reinforced concrete slab and the supporting bearing medium. A common method of modeling the soil structure interaction is to consider the bearing medium to be elastic and to assign a subgrade modulus. However, glacial till is not elastic and limits have to be placed on the stress ranges of a particular modulus.

The proposed buildings can be designed using the above parameters with total and differential settlements of 25 and 20 mm, respectively.

5.4 Design for Earthquakes

Shear wave velocity testing was completed at the subject site to accurately determine the applicable seismic site classification for the proposed development in accordance with the latest revision of OBC 2024. The shear wave velocity testing was completed by Paterson personnel. The results of the shear wave velocity test are provided in Figures 2 and 3 in Appendix 2.

Field Program

The seismic array testing location was placed within the central area of the site in an approximate north-south direction as presented in Drawing PG5901-1 - Test Hole Location Plan in Appendix 2. Paterson field personnel placed 24 horizontal 2.4 Hz. geophones mounted to the surface by means of two 75 mm ground spikes attached to the geophone land case. The geophones were spaced at 2 m intervals and connected by a geophone spread cable to a Geode 24 Channel seismograph. The seismograph was also connected to a computer laptop and a hammer trigger switch attached to a 12-pound dead blow hammer. The hammer trigger switch sends a start signal to the seismograph. The hammer is used to strike an I-Beam seated into the ground surface, which creates a polarized shear wave. The hammer shots are repeated between four (4) and eight (8) times at each shot location to improve signal to noise ratio.

The shot locations are also completed in forward and reverse direction (i.e.- striking both sides of the I-Beam seated parallel to the geophone array). The shot locations were 15, 3, and 2 m away from the first and last geophones, and at the centre of the seismic array.

Data Processing and Interpretation

Interpretation for the shear wave velocity results were completed by Paterson personnel. Shear wave velocity measurement was made using reflection/refraction methods. The interpretation is performed by recovering arrival times from direct and refracted waves.

The interpretation is repeated at each shot location to provide an average shear wave velocity, V_{s30}, of the upper 30 m profile, immediately below the finished grade. The layer intercept times, velocities from different layers and critical distances are interpreted from the shear wave records to compute the bedrock depth at each location.

The bedrock velocity was interpreted using the main refractor wave velocity, which is considered a conservative estimate of the bedrock velocity due to the increasing quality of the bedrock with depth. It should be noted that as bedrock quality increases, the bedrock shear wave velocity also increases.

Seismic Site Class

For this scenario, the V_{S30} was calculated as follows:

$$V_{s30} = \frac{Depth_{of\ interest}(m)}{\left(\frac{Depth_{Lay}\quad(m)}{V_{s_{Laye}}\quad(m/s)} + \frac{Depth_{Layer2}(m)}{V_{s_{Layer2}}(m/s)}\right)}$$

$$V_{s30=} \frac{30\ m}{\left(\frac{14\ m}{420\ m/s} + \frac{16\ m}{2{,}464\ m/s}\right)}$$

$$V_{s30=}\ 753\ m/s$$

The average shear wave velocity, V_{s30}, is **753 m/s**, therefore, as per OBC 2024, a **Site Designation X_{753}** is applicable for seismic design of the proposed buildings. The soils underlying the subject site are not susceptible to liquefaction.

5.5 Basement Slab

With the removal of all topsoil and deleterious fill from within the footprint of the proposed building, the native soil will be considered an acceptable subgrade on which to commence backfilling for floor slab construction. It is understood that the underground level(s) will be mostly parking and the recommended pavement structures noted in Section 5.7 will be applicable.

However, if storage or other uses of the lower level will involve the construction of a concrete floor slab, the upper 200 mm of sub-slab fill is recommended to consist of 19 mm clear crushed stone.

Any soft areas in the basement slab subgrade should be removed and backfilled with appropriate backfill material prior to placing fill. OPSS Granular A or Granular B Type II, with a maximum particle size of 50 mm, are recommended for backfilling below the floor slab. All backfill material within the footprint of the proposed building should be placed in maximum 300 mm thick loose layers and compacted to a minimum of 98% of the SPMDD.

In consideration of the groundwater conditions encountered during the field investigation, a sub-slab drainage system, consisting of lines of perforated drainage pipe subdrains connected to a sump pit, should be provided in the subfloor fill under the lower basement floor (discussed further in Subsection 6.1).

5.6 Basement Wall

There are several combinations of backfill materials and retained soils that could be applicable for the basement walls of the subject structure. However, the conditions can be well-represented by assuming the retained soil consists of a material with an angle of internal friction of 30 degrees and a bulk (drained) unit weight of 20 kN/m^3.

Where undrained conditions are anticipated (i.e below the groundwater level), the applicable effective (undrained) unit weight of the retained soil can be taken as 13 kN/m^3 where applicable. A hydrostatic pressure should be added to the total static earth pressure when calculating the effective unit weight.

Lateral Earth Pressures

The static horizontal earth pressure (p_o) can be calculated using a triangular earth pressure distribution equal to $K_o \cdot \gamma \cdot H$ where:

K_o = at-rest earth pressure coefficient of the applicable retained material (0.5)
γ = unit weight of fill of the applicable retained soil (kN/m^3)
H = height of the wall (m)

An additional pressure having a magnitude equal to $K_o \cdot q$ and acting on the entire height of the wall should be added to the above diagram for any surcharge loading, q (kPa), that may be placed at ground surface adjacent to the wall. The surcharge pressure will only be applicable for static analyses and should not be used in conjunction with the seismic loading case.

Actual earth pressures could be higher than the "at-rest" case if care is not exercised during the compaction of the backfill materials to maintain a minimum separation of 0.3 m from the walls with the compaction equipment.

Seismic Earth Pressures

The total seismic force (P_{AE}) includes both the earth force component (P_o) and the seismic component (ΔP_{AE}).

The seismic earth force (ΔP_{AE}) can be calculated using $0.375 \cdot a_c \cdot \gamma \cdot H^2/g$ where:

a_c = $(1.45 - a_{max}/g)a_{max}$
γ = unit weight of fill of the applicable retained soil (kN/m^3)
H = height of the wall (m)
g = gravity, 9.81 m/s^2

The peak ground acceleration (a_{max}) for the Ottawa area is 0.32 g according to OBC 2024. Note that the vertical seismic coefficient is assumed to be zero.

The earth force component (P_o) under seismic conditions can be calculated using $P_o = 0.5\ K_o\ \gamma\ H^2$, where $K_o = 0.5$ for the soil conditions noted above.

The total earth force (P_{AE}) is considered to act at a height, h (m), from the base of the wall, where:

$h = \{P_o \cdot (H/3) + \Delta P_{AE} \cdot (0.6 \cdot H)\}/P_{AE}$

The earth forces calculated are unfactored. For the ULS case, the earth loads should be factored as live loads, as per OBC 2024.

5.7 Rock Anchor Design

Overview of Anchor Features

The geotechnical design of grouted rock anchors in sedimentary bedrock is based upon two possible failure modes. The anchor can fail either by shear failure along the grout/rock interface or a 60 to 90 degree pullout of rock cone with the apex of the cone near the middle of the bonded length of the anchor. Interaction may develop between the failure cones of anchors that are relatively close to one another resulting in a total group capacity smaller than the sum of the load capacity of each individual anchor.

A third failure mode of shear failure along the grout/steel interface should be reviewed by the structural engineer to ensure all typical failure modes have been reviewed.

The anchor should be provided with a bonded length at the base of the anchor which will provide the anchor capacity, as well an unbonded length between the rock surface and the top of the bonded length.

Permanent anchors should be provided with corrosion protection. As a minimum, the entire drill hole should be filled with cementious grout. The free anchor length is provided by installing a plastic sleeve to act as a bond break, with the sleeve filled with grout or a corrosion inhibiting mastic. Double corrosion protection can be provided with factory assembled systems, such as those available from Dywidag Systems or Williams Form Engineering Corp. Recognizing the importance of the anchors for the long term performance of the foundation of the proposed building, the rock anchors for this project are recommended to be provided with double corrosion protection.

Grout to Rock Bond

The Canadian Foundation Engineering Manual recommends a maximum allowable grout to rock bond stress (for sound rock) of 1/30 of the unconfined compressive strength (UCS) of either the grout or rock (but less than 1.3 MPa) for an anchor of minimum length (depth) of 3 m. Generally, the UCS of sandstone ranges between about 50 and 80 MPa, which is stronger than most routine grouts. A factored tensile grout to rock bond resistance value at ULS of **1.0 MPa**, incorporating a resistance factor of 0.4, can be calculated. A minimum grout strength of 40 MPa is recommended.

Rock Cone Uplift

As discussed previously, the geotechnical capacity of the rock anchors depends on the dimensions of the rock anchors and the configuration of the anchorage system. Based on existing bedrock information, a Rock Mass Rating (RMR) of 65 was assigned to the bedrock, and Hoek and Brown parameters (m and s) were taken as 0.575 and 0.00293, respectively.

Recommended Rock Anchor Lengths

Parameters used to calculate rock anchor lengths are provided in Table 2 on the following page:

Table 2 - Parameters used in Rock Anchor Review	
Grout to Rock Bond Strength - Factored at ULS	1.0 MPa
Compressive Strength - Grout	40 MPa
Rock Mass Rating (RMR) - Good quality Sandstone Hoek and Brown parameters	65 m=0.575 and s=0.00293
Unconfined compressive strength - Limestone bedrock	50 MPa
Unit weight - Submerged Bedrock	15.5 kN/m^3
Apex angle of failure cone	60^o
Apex of failure cone	mid-point of fixed anchor length

The fixed anchor length will depend on the diameter of the drill holes. Recommended anchor lengths for a 75 mm and 125 mm diameter hole are provided in Table 3 on the next page. The factored tensile resistance values given in Table 2 are based on a single anchor with no group influence effects. A detailed analysis of the anchorage system, including potential group influence effects, could be provided once the details of the loading for the proposed building are determined.

Table 3 - Recommended Rock Anchor Lengths - Grouted Rock Anchor

Diameter of Drill Hole (mm)	Anchor Lengths (m)			Factored Tensile Resistance (kN)
	Bonded Length	Unbonded Length	Total Length	
75	2.0	0.8	2.8	450
	2.6	1.0	3.6	600
	3.2	1.3	4.5	750
	4.5	2.0	6.5	1000
125	1.6	1.0	2.6	600
	2.0	1.2	3.2	750
	2.6	1.4	4.0	1000
	3.2	1.8	5.0	1250

Other considerations

The anchor drill holes should be within 1.5 to 2 times the rock anchor tendon diameter, inspected by geotechnical personnel and should be flushed clean prior to grouting. A tremie tube is recommended to place grout from the bottom of the anchor holes.

The geotechnical capacity of each rock anchor should be proof tested at the time of construction. More information on testing can be provided upon request. Compressive strength testing is recommended to be completed for the rock anchor grout. A set of grout cubes should be tested for each day that grout is prepared.

5.8 Pavement Design

For design purposes, it is recommended that the rigid pavement structure for the lowest level of the underground parking structure should consist of Category C2, 32 MPa concrete at 28 days with air entrainment of 5 to 8%. The recommended rigid pavement structure is further presented in Table 4 on the following page. The flexible pavement structure presented in Tables 5 and 6 should be used for exterior, at grade parking areas and access lanes, respectively.

Table 4 - Recommended Rigid Pavement Structure - Lower Parking Level

Thickness (mm)	Material Description
125	**Exposure Class C2 – 32 MPa Concrete** (5 to 8 % Air Entrainment)
300	**BASE** - OPSS Granular A Crushed Stone
SUBGRADE – Imported fill or OPSS Granular B Type **I** or **II** or material placed over in situ soil.	

To control cracking due to shrinking of the concrete floor slab, it is recommended that strategically located saw cuts be used to create control joints within the concrete floor slab of the lower underground parking level. The control joints are generally recommended to be located at the center of the column lines and spaced at approximately 24 to 36 times the slab thickness (for example, a 0.15 m thick slab should have control joints spaced between 3.6 and 5.4 m). The joints should be cut between 25 and 30% of the thickness of the concrete floor slab and completed as early as 4 hours after the concrete has been poured during warm temperatures and up to 12 hours during cooler temperatures.

Table 5 - Recommended Pavement Structure – Car Only Parking Areas

Thickness (mm)	Material Description
50	**Wear Course** - HL-3 or Superpave 12.5 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
300	**SUBBASE** - OPSS Granular B Type **II**
SUBGRADE - OPSS Granular B Type **I** or **II** placed over in-situ soil, or concrete fill.	

Table 6 - Recommended Asphalt Pavement Structure - Access Lanes and Heavy Loading Parking Areas

Thickness (mm)	Material Description
40	**Wear Course** – HL-3 or Superpave 12.5 Asphaltic Concrete
50	**Wear Course** – HL-8 or Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
300	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - OPSS Granular B Type I or II placed over in-situ soil, or concrete fill.	

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project. The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 99% of the material's SPMDD using suitable vibratory equipment, noting that excessive compaction can result in subgrade softening.

If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type I or II material.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

Water Suppression System and Foundation Drainage

To limit long-term groundwater lowering, it is recommended that a groundwater infiltration control system be designed for proposed buildings with footing elevations below the long-term groundwater table. Waterproofing of the foundation wall is recommended, and the membrane is to be installed starting at 4 m below grade down to the founding elevation. The waterproofing membrane should also be extended horizontally below the proposed footings a minimum of 600 mm away from the face of the excavation. The membrane will serve as a water infiltration suppression system. Specific waterproofing recommendations and design can be provided for the proposed multi-storey buildings once detailed foundation design drawings are available.

It is also recommended that the composite drainage system, such as Delta Drain 6000 or equivalent, be installed between the waterproofing membrane and the foundation wall, and extend from the exterior finished grade to the founding elevation (underside of footing or raft slab). The purpose of the composite drainage system is to direct any water infiltration resulting from a breach of the waterproofing membrane to the building sump pit.

It is recommended that 150 mm diameter sleeves at 3 m centres be cast in the foundation wall at the footing or raft slab interface to allow the infiltration of water to flow to an interior perimeter underslab drainage pipe. The perimeter drainage pipe should direct water to sump pit(s) within the lower basement area.

Foundation Raft Slab Construction Joints

It is expected that the raft slab, where utilized, will be poured in sections. For the construction joint at each pour, a rubber water stop along with a chemical grout (Xypex or equivalent) should be applied to the entire vertical joint of the slab. Furthermore, a rubber water stop should be incorporated in the horizontal interface between the foundation wall and the raft slab.

Sub-slab Drainage

Sub-slab drainage will be required to control water infiltration below the lowest underground parking level slab for the proposed buildings. For design purposes, it is recommended that a 150 mm diameter perforated pipe be placed at 6 m centres.

The final spacing of the underfloor drainage system should be confirmed at the time of completing the excavation when water infiltration can be better assessed.

Podium Deck Tie-In for Waterproofing System

It is expected that a waterproofing system will be provided for the podium deck surface. It is recommended that the podium deck waterproofing system consist of a layer of hot rubber membrane applied to the concrete surface. The concrete should be cleaned of any dust, dirt, or debris prior to the application of the hot rubber. The hot rubber should be overlain by a 50 mm thick layer of HI-60 rigid insulation, or equivalent, and further overlain by a foundation drainage board (6000 series by DeltaDrain, G100N MiraDrain, or approved equivalent installed with the geotextile side facing up.

The hot rubber should be applied to the geotextile side of the drainage board to cover the cold joint a minimum of 150 mm. A termination bar should be installed as per manufacture's specifications. The podium deck drainage board can then be overlapped to cover the cold joint a minimum of 150 mm. Further details can be provided once the final design drawings are made available.

Foundation Backfill

Backfill against the exterior sides of the foundation walls, should consist of free-draining, non-frost susceptible granular materials. The greater part of the site excavated materials will be relatively frost susceptible and, as such, are not recommended for re-use as backfill against the foundation walls, unless used in conjunction with a drainage geocomposite, such as Miradrain G100N or Delta Drain 6000, connected to the perimeter foundation drainage system. Imported granular materials, such as clean sand or OPSS Granular B Type 1, Granular A or Granular B Type II granular material, should otherwise be used for this purpose.

Sidewalks and Walkways

Backfill material below sidewalk and walkway subgrade areas or other settlement sensitive structures which are not adjacent to the buildings should consist of free-draining, non-frost susceptible material. This material should be placed in maximum 300 mm thick loose lifts and compacted to at least 98% of its SPMDD under dry and above freezing conditions.

6.2 Protection of Footings Against Frost Action

Perimeter foundations of heated structures are required to be insulated against the deleterious effects of frost action. A minimum of 1.5 m of soil cover should be provided for adequate frost protection for heated structures.

Exterior unheated footings, such as those for isolated exterior piers, are more prone to deleterious movement associated with frost action than the exterior walls of the heated structure and require additional protection, such as soil cover of 2.1 m or an equivalent combination of soil cover and foundation insulation.

However, the foundations are generally not expected to require protection against frost action due to the founding depth. Unheated structures such as the access ramp may require insulation for protection against the deleterious effects of frost action.

6.3 Excavation Side Slopes

The side slopes of the excavation should either be cut back at acceptable slopes or be retained by shoring systems from the beginning of the excavation until the structure is backfilled. However, for most of the site, insufficient room will be available to permit the building excavation to be constructed by open-cut methods (i.e., unsupported excavations).

Unsupported Excavations

The excavation side slopes above the groundwater level extending to a maximum depth of 3 m should be cut back at 1H:1V or flatter. The flatter slope is required for excavation below groundwater level. The subsoil at this site is considered to be mainly a Type 2 and 3 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects.

Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should be kept away from the excavation sides.

Slopes in excess of 3 m in height should be periodically inspected by the geotechnical consultant in order to detect if the slopes are exhibiting signs of distress.

It is recommended that a trench box be used at all times to protect personnel working in trenches with steep or vertical sides. It is expected that services will be installed by “cut and cover” methods and excavations will not be left open for extended periods of time.

Temporary Shoring

Due to the anticipated proximity of the proposed development to the property boundaries, temporary shoring may be required to support the overburden soils. The shoring requirements will depend on the depth of the excavation and the proximity of the adjacent structures. However, it should be noted that the observed bouldery conditions can lead to the creation of voids and other unstable conditions during installation of the temporary shoring as boulders shift within the fine soil matrix. Furthermore, it may be difficult to develop the required anchor strength in soil due to variations in soil conditions.

The design and approval of the shoring system will be the responsibility of the shoring contractor and the shoring designer who is a licensed professional engineer and is hired by the shoring contractor. It is the responsibility of the shoring contractor to ensure that the temporary shoring is in compliance with safety requirements, designed to avoid any damage to adjacent structures and include dewatering control measures.

In the event that subsurface conditions differ from the approved design during the actual installation, it is the responsibility of the shoring contractor to commission the required experts to re-assess the design and implement the required changes.

The designer should also take into account the impact of a significant precipitation event and designate design measures to ensure that a precipitation will not negatively impact the shoring system or soils supported by the system. Any changes to the approved shoring design system should be reported immediately to the owner's representative prior to implementation.

The temporary shoring system may consist of a soldier pile and lagging system. The shoring system is recommended to be adequately supported to resist toe failure. Any additional loading due to street traffic, construction equipment, adjacent structures and facilities, etc., should be added to the earth pressures described below.

The earth pressures acting on the temporary shoring system may be calculated using the parameters outlined in Table 7 on the next page.

Table 7 - Soil Parameters for Calculating Earth Pressures Acting on Shoring System

Parameter	Value
Active Earth Pressure Coefficient (K_a)	0.33
Passive Earth Pressure Coefficient (K_p)	3
At-Rest Earth Pressure Coefficient (K_o)	0.5
Unit Weight (γ), kN/m^3	21
Submerged Unit Weight(γ'), kN/m^3	13

The active earth pressure should be calculated where wall movements are permissible while the at-rest pressure should be calculated if no movement is permissible.

The dry unit weight should be used above the groundwater level while the effective unit weight should be used below the groundwater level.

The hydrostatic groundwater pressure should be added to the earth pressure distribution wherever the effective unit weights are used for earth pressure calculations. If the groundwater level is lowered, the dry unit weight for the soil should be used full weight, with no hydrostatic groundwater pressure component. For design purposes, the minimum factor of safety of 1.5 should be calculated.

6.4 Pipe Bedding and Backfill

Bedding and backfill materials should be in accordance with the most recent Material Specifications and Standard Detail Drawings from the Department of Public Works and Services, Infrastructure Services Branch of the City of Ottawa. At least 150 mm of OPSS Granular A should be used for pipe bedding for sewer and water pipes. The bedding should extend to the spring line of the pipe.

Cover material, from the spring line to at least 300 mm above the obvert of the pipe, should consist of OPSS Granular A or Granular B Type II with a maximum size of 25 mm. The bedding and cover materials should be placed in maximum 225 mm thick lifts compacted to 99% of the material's SPMDD.

Where hard surface areas are considered above the trench backfill, the trench backfill material within the frost zone (about 1.8 m below finished grade) should match the soils exposed at the trench walls to reduce potential differential frost heaving. The trench backfill should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 95% of the material's SPMDD.

6.5 Groundwater Control

Groundwater Control for Building Construction

It is anticipated that groundwater infiltration into the excavations should be controllable using open sumps. The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium.

Permit to Take Water

A temporary Ministry of the Environment, Conservation and Parks (MECP) permit to take water (PTTW) may be required for this project if more than 400,000 L/day of ground and/or surface water is to be pumped during the construction phase. A minimum 4 to 5 months should be allowed for completion of the PTTW application package and issuance of the permit by the MECP.

For typical ground or surface water volumes being pumped during the construction phase, typically between 50,000 to 400,000 L/day, it is required to register on the Environmental Activity and Sector Registry (EASR). A minimum of two to four weeks should be allotted for completion of the EASR registration and the Water Taking and Discharge Plan to be prepared by a Qualified Person as stipulated under O.Reg. 63/16. If a project qualifies for a PTTW based upon anticipated conditions, an EASR will not be allowed as a temporary dewatering measure while awaiting the MECP review of the PTTW application.

Impacts on Neighbouring Properties

Since the proposed development will be founded below the long-term groundwater level, a waterproofing membrane system has been recommended to lessen the effects of water infiltration. Any long-term dewatering of the site will therefore be minimal and will have no adverse effects to the surrounding buildings or structures. The short-term dewatering during the excavation program, which is expected to be minimal, will be managed by the excavation contractor.

6.6 Winter Construction

Precautions must be taken if winter construction is considered for this project. The subsoil conditions at this site consist of frost susceptible materials. In the presence of water and freezing conditions, ice could form within the soil mass. Heaving and settlement upon thawing could occur.

In the event of construction during below zero temperatures, the founding stratum should be protected from freezing temperatures by the use of straw, propane heaters and tarpaulins or other suitable means. In this regard, the base of the excavations should be insulated from sub-zero temperatures immediately upon exposure and until such time as heat is adequately supplied to the building and the footings are protected with sufficient soil cover to prevent freezing at founding level.

Trench excavations and pavement construction are also difficult activities to complete during freezing conditions without introducing frost in the subgrade or in the excavation walls and bottoms. Precautions should be taken if such activities are to be carried out during freezing conditions. Additional information could be provided, if required.

Precaution must be taken where excavations are carried out in proximity of existing structures which may be adversely affected due to the freezing conditions. In particular, it should be recognized that where a shoring system is used, the soil behind the shoring system will be subjected to freezing conditions and could result in heaving of the structure(s) placed within or above frozen soil.

Provisions should be made in the contract document to protect the walls of the excavations from freezing, if applicable.

6.7 Corrosion Potential and Sulphate

The results of analytical testing show that the sulphate content is less than 0.1%. This result is indicative that Type 10 Portland cement (normal cement) would be appropriate for this site. The chloride content and the pH of the sample indicate that they are not significant factors in creating a corrosive environment for exposed ferrous metals at this site, whereas the resistivity is indicative of a moderate to aggressive corrosive environment.

7.0 Recommendations

It is recommended that the following be completed once the master plan and site development are determined.

- ❑ Review of the geotechnical aspects of the excavation contractor's shoring design, if required, prior to construction.
- ❑ Review of waterproofing details for the elevator shaft and building sump pits.
- ❑ Review and inspection of the foundation waterproofing system and all foundation drainage systems.
- ❑ Observation of all bearing surfaces prior to the placement of concrete.
- ❑ Sampling and testing of the concrete and fill materials.
- ❑ Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- ❑ Complete a full inspection program of the installation of the perimeter and underground floor drainage system during construction.
- ❑ Observation of all subgrades prior to backfilling.
- ❑ Field density tests to determine the level of compaction achieved.
- ❑ Sampling and testing of the bituminous concrete including mix design reviews.

A report confirming that these works have been conducted in general accordance with our recommendations could be issued upon the completion of a satisfactory inspection program by the geotechnical consultant.

8.0 Statement of Limitations

The recommendations provided herein are in accordance with our present understanding of the project. Paterson requests permission to review the recommendations when the drawings and specifications are completed.

A soils investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, Paterson requests immediate notification to permit reassessment of our recommendations.

The recommendations provided herein should only be used by the design professionals associated with this project. They are not intended for contractors bidding on or undertaking the work. The latter should evaluate the factual information provided in this report and determine the suitability and completeness for their intended construction schedule and methods. Additional testing may be required for their purposes.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Parkway House Development Fund LP or their agents is not authorized without review by Paterson for the applicability of our recommendations to the alternative use of the report.

Paterson Group Inc.

Kevin A. Pickard, P.Eng.

Scott S. Dennis, P.Eng.

Report Distribution:

- ❑ Parkway House Development Fund LP (email copy)
- ❑ Paterson Group (1 copy)

With every community, we redefine what's possible.

Stantec is a global leader in sustainable engineering, architecture, and environmental consulting. The diverse perspectives of our partners and interested parties drive us to think beyond what's previously been done on critical issues like climate change, digital transformation, and future-proofing our cities and infrastructure. We innovate at the intersection of community, creativity, and client relationships to advance communities everywhere, so that together we can redefine what's possible.